ELECTRICAL SOUTH

JANUARY
1944

52-In Hotel Type

FANS by HUNTER CENTURY

55th SEASON

24-In "Airspread" Ceiling

HUNTER, who has made fans and ventilators exclusively during 55 years, is now operating under War Production Board restrictions. • No more fans will be made except for the Army, Navy and Maritime Commission. • HUNTER unfilled orders now on hand represent contracts with Government Agencies. • Certain sizes of belted exhaust types can be made available for Government hospitals and other war industries, subject to limited material inventories now on hand.

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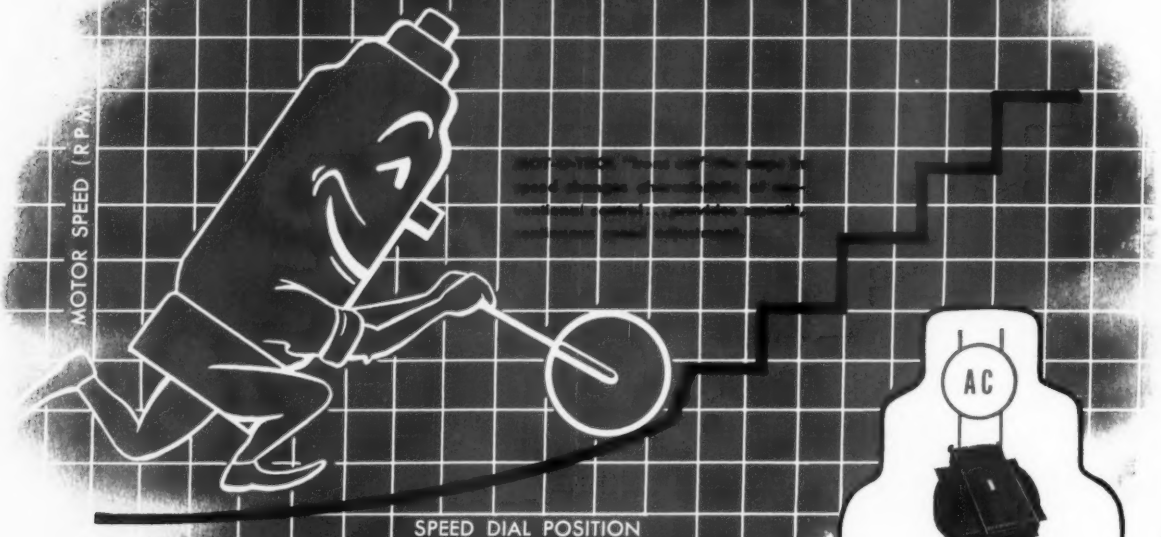
New Smooth...Stepless...Wide-Range

MOTOR SPEEDS FROM ALTERNATING CURRENT...



Electronically with

MOT-O-TROL

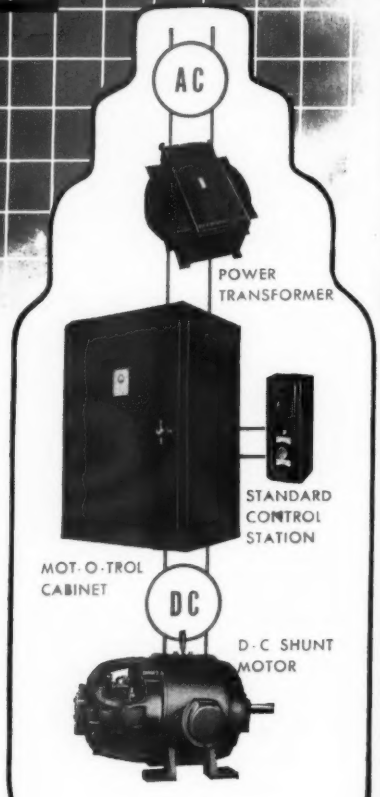
MOT-O-TROL—a new Westinghouse development—now makes possible a wide-range, stepless selection of motor speeds for machine tools . . : *with the precision of electronics*. Operating directly on alternating current, MOT-O-TROL offers important advantages even over conventional d-c motor drives (where d-c is available).

MOT-O-TROL provides finger-tip control—all drive speeds are obtainable from *one* small dial. There is only one rotating part—the driving motor. Vibration is minimized—an important factor in obtaining better surface finish with grinders.

Once speed is set, MOT-O-TROL automatically maintains pre-set motor speeds under all loads. Acceleration is smooth. Starting shock and current peaks are minimized.

Other available MOT-O-TROL functions include: dynamic braking, reversing, inching forward, inching reverse. Send for booklet B-3256 or call your Westinghouse Office for complete information. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

J-21283



HOW MOT-O-TROL WORKS

MOT-O-TROL rectifies alternating current and supplies direct current to fields and armature of a d-c drive motor. Speed control dial on control station varies these voltages through electronic rectifying tubes—thus changing motor speeds. Acceleration current also is limited electronically.

ELECTRONICS AT WORK

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

Electronic **MOTOR CONTROL**

ELECTRICAL SOUTH is published monthly by W. R. C. Smith Publishing Co., Marietta, Ga., and Atlanta, Ga., U. S. A. Subscription rates, United States and Possessions, $1.00 for one year; Canada, $1.50 per year; Foreign Countries, $2.00 per year. Entered as second class matter at the postoffice, Marietta, Ga., under Act of March 3, 1879.

Volume 24 Number 1

Make a good splice better with

Panther and Dragon Rubber Tapes

It is obvious that the wrapping of an insulated wire or cable splice with new insulation must be done so as to restore the insulating value of the original covering.

Only high grade compound, properly "plasticized" to obtain satisfactory electrical and physical properties, is used in the manufacture of PANTHER and DRAGON Rubber Tapes. It will mould into a homogeneous mass of insulation and vulcanize *after* application to the splice. It has high dielectric strength and insulation resistance. It more than complies with all the requirements of A.S. T.M. and Federal Emergency Specifications.

Investigate *all* the advantages of PANTHER and DRAGON Friction and Rubber Tapes and the reasons why they are being specified and used by electrical contractors throughout the country.

Sold Through Recognized Independent Wholesalers.

Friction tapes are available in both PANTHER and DRAGON Brands.

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1. Guaranteed Footage	1. Guaranteed Footage
2. Substantial Fabric	2. High Grade Compound
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4. High Dielectric Strength	4. High Elongation
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6. Uniform Thickness	6. Uniformity of Thickness and Width
7. Uniform Width	7. Excellent Fusion
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10. Colorful, Attractive Boxes	10. Colorful, Attractive Boxes

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FRICTION AND RUBBER TAPES
HAZARD INSULATED WIRE WORKS — DIVISION OF THE OKONITE CO.
WILKES-BARRE, PENNSYLVANIA • OFFICES IN PRINCIPAL CITIES

2317

Power enough to

Nearly 1,000,000 horsepower per day! That's the growing might of America's air-power! Engines are safer too, more reliable . . . built to higher standards in plants equipped for better *"See-ability."*

Engines today are incredibly precise!

They are built to standards of perfection that make fine watches seem crude. Mechanical failure is almost unheard of.

Modern improved lighting—better "See-ability" for everyone—helps make this possible.

With better "See-ability", technicians more efficiently explore materials for hidden flaws . . . machine operators work to closer limits, turn out parts faster. Inspectors too do their work better.

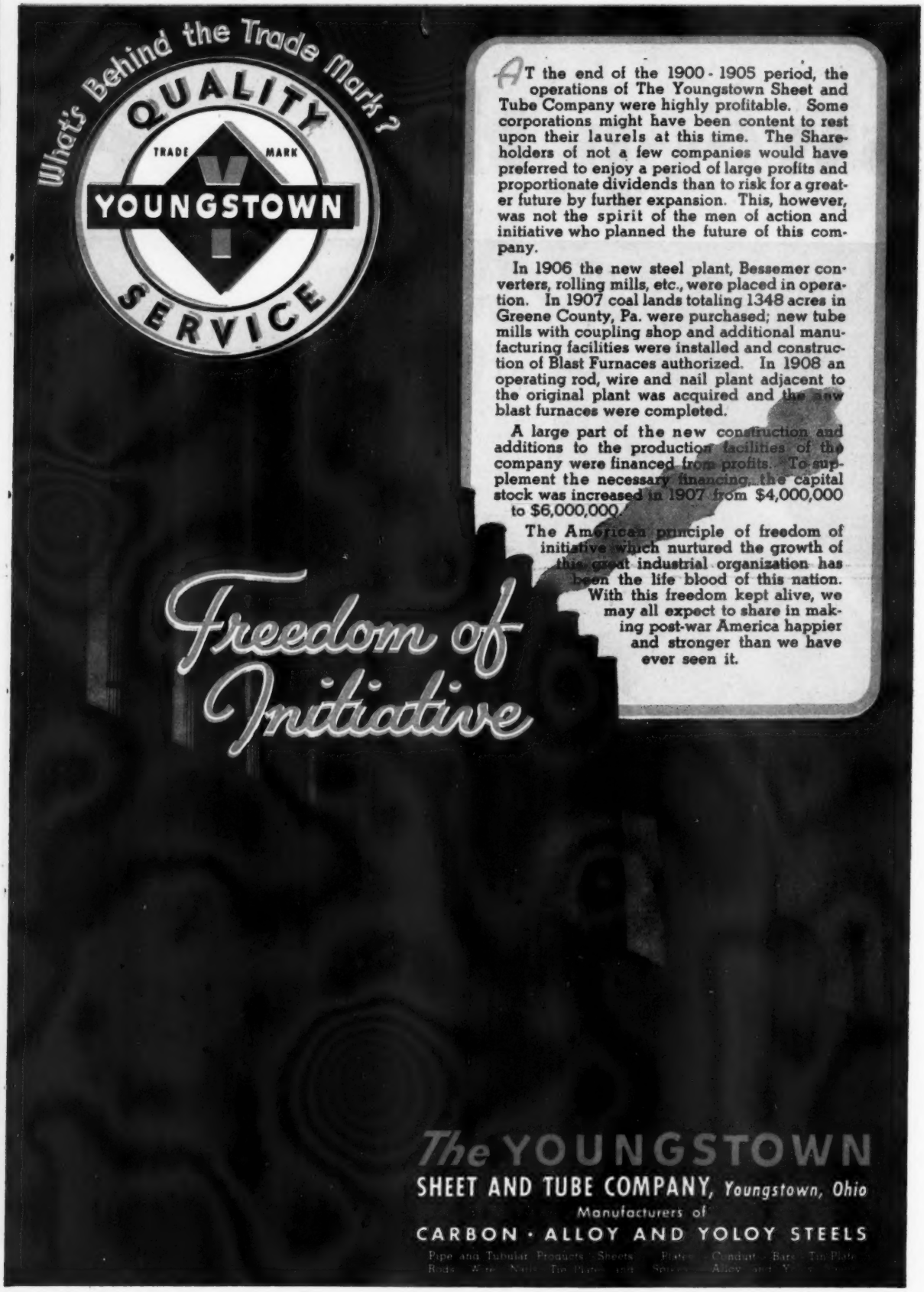
Brighter, longer-lasting than ever before, today's Westinghouse Mazda Lamps light many of the plants where airplane engines are made.

Watch Westinghouse! When the big job of war production is done, Westinghouse lighting improvements will again be available for factories, offices, stores, homes. Many advances in design, and construction have already been made; dramatic improvements are in the offing. Recommend Westinghouse Mazda Lamps for better "See-ability." Westinghouse Electric and Manufacturing Co., Bloomfield, N.J. *Plants in 25 cities... offices everywhere.*

Photographs, courtesy Wright Aeronautical Corporation, Paterson, N.J.

sweep the skies

★ LET'S ALL BACK THE ATTACK . . . BUY *MORE* WAR BONDS ★


What's Behind the Trade Mark?
QUALITY
TRADE MARK
YOUNGSTOWN
SERVICE
Freedom of Initiative
AT the end of the 1900 - 1905 period, the operations of The Youngstown Sheet and Tube Company were highly profitable. Some corporations might have been content to rest upon their laurels at this time. The Shareholders of not a few companies would have preferred to enjoy a period of large profits and proportionate dividends than to risk for a greater future by further expansion. This, however, was not the spirit of the men of action and initiative who planned the future of this company.
In 1906 the new steel plant, Bessemer converters, rolling mills, etc., were placed in operation. In 1907 coal lands totaling 1348 acres in Greene County, Pa. were purchased; new tube mills with coupling shop and additional manufacturing facilities were installed and construction of Blast Furnaces authorized. In 1908 an operating rod, wire and nail plant adjacent to the original plant was acquired and the new blast furnaces were completed.
A large part of the new construction and additions to the production facilities of the company were financed from profits. To supplement the necessary financing, the capital stock was increased in 1907 from $4,000,000 to $6,000,000.
The American principle of freedom of initiative which nurtured the growth of this great industrial organization has been the life blood of this nation. With this freedom kept alive, we may all expect to share in making post-war America happier and stronger than we have ever seen it.
The YOUNGSTOWN
SHEET AND TUBE COMPANY, Youngstown, Ohio
Manufacturers of
CARBON · ALLOY AND YOLOY STEELS
Pipe and Tubular Products · Sheets · Plates · Conduit · Bars · Tin Plate
Rods · Wire · Nails · Tin Plate · Spikes · Alloy and Y

AN ANNOUNCEMENT OF GREAT IMPORTANCE TO THE BUILDING INDUSTRY

WHAT types of electrical equipment will be needed in the homes of tomorrow?

Where should fixed equipment be placed in kitchens and laundries? How about dimensions and clearances—access for servicing—lighting outlets and controls—utility connections?

Westinghouse has long recognized the need for accurate information on these subjects . . . and for this reason has created the

BETTER HOMES DEPARTMENT

The Westinghouse Better Homes Department was created to assist the building profession in the planning of postwar housing . . . and to give authoritative technical advice on the *proper applications of electricity* which will contribute so much to better living in 194X.

To achieve these ends, Westinghouse has organized the *Better Homes Advisory Staff*, consisting of men of recognized standing and wide experience in the housing field:

IRVING W. CLARK, MANAGER, who has been continuously engaged in housing activities for nearly 25 years . . . a nationally recognized authority on home planning and kitchen design . . . and a Director of Producers Council, Inc.

A. CARL BREDAHL, TECHNICAL DIRECTOR, formerly Chief of the Mechanic-Electrical-Utilities Division of the Federal Public Housing Authority from 1934 to 1943, where he was responsible for establishing design standards of mechanical and electrical installations for U. S. Government housing projects . . . and for 7 years electrical designer for Warren & Wetmore, New York.

JOHN S. VAN WART, REGISTERED ARCHITECT, formerly with Fred F. French Company, New York, who has designed many multiple dwellings, hotels, and institutions during the past 30 years . . . including Knickerbocker Village, 10 Gracie Square, and Blind Brook Lodge in the New York area.

SIX-POINT ADVISORY SERVICE

The Better Homes Department offers a *Six-Point Advisory Service* to the building profession, featuring advice on the following subjects:

1—Selection of correct types of electrical equipment for various classes of postwar homes.

2—Location and arrangement of fixed equipment, for conserving space and attaining maximum efficiency in arrangement of work cycles.

3—Accurate dimensions and clearances of equipment to insure proper installation and efficient operation.

4—Access for servicing of equipment—so necessary for periodic inspection and repair.

5—Location of lighting outlets and controls, for greater enjoyment, comfort, and safety in the home.

6—Utility service connections—including location and size of electric wiring, water supply, and drainage lines.

This Six-Point Advisory Service is available to contractors, builders, architects, engineers, public utilities, housing authorities, electrical inspectors, building management, and investment institutions.

Westinghouse Better Homes Department welcomes the opportunity of giving constructive assistance to those interested in postwar housing.

If you have any problems relating to the selection, installation, and use of home electrical equipment, write: Better Homes Department, Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pennsylvania.

A NEW APPROACH TO ELECTRICAL LIVING IN 194X

A carefully co-ordinated program . . . for assisting the building profession and homeowners in the attainment of *better wiring for better living* . . . will be announced soon. *Watch for it!*

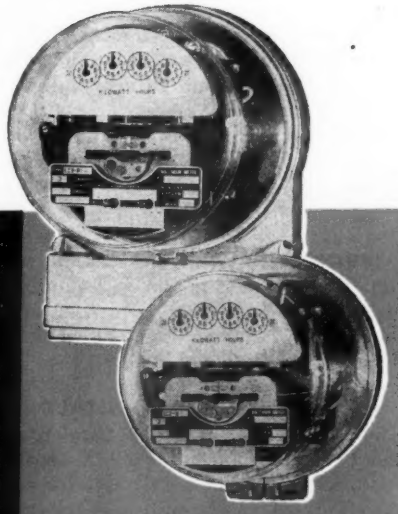
Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

WAR BONDS MAKE
UNCLE SAM MORE
POWER-*full*

"On Measurement is founded the whole progress of man.."

Can't you almost take the words right out of this Roman lassie's mouth? "I've been undone," she is about to exclaim as she watches the weight swing downward while her newly boughten gems swing high and lightly. She had been told that the Egyptian "Talent" was the same as the Roman "Libra". It was, too. That is, almost. If sufficient detailed information had been given, it would have revealed that the Talent was slightly lighter than the Libra — enough to unbalance her scales. There are no such uncertainties in today's high standard of measurement of electricity set and met by the electric utilities and the manufacturers of watthour meters.



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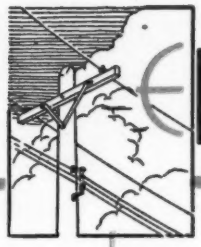
SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

JANUARY
1944

Volume 24 No. 1



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It's Easy

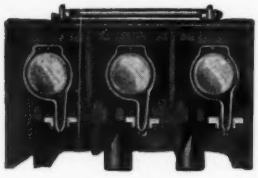
to slip in the fuses— but they're *clamped tight* for perfect contact . . .

Fuse clamp switch blades open slightly when fuse is inserted. This results in a tight clamping contact when fuse clamp switch blades are inserted in switch contact slots.

Fuses slide easily and quickly into place. No adjustment necessary

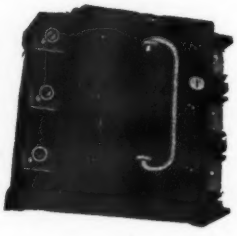
The FA PULFUZSWITCH

insures against loose contacts and resultant overheating . . . The fuse-holding switch blades are so designed that the placing of the fuse carrier into the ON position of the switch automatically *clamps the fuses tight* . . . At the same time, the switch blades make *pressure contact* with the fixed switch parts, insuring full current carrying capacity. . . . These photographs show how this is accomplished.



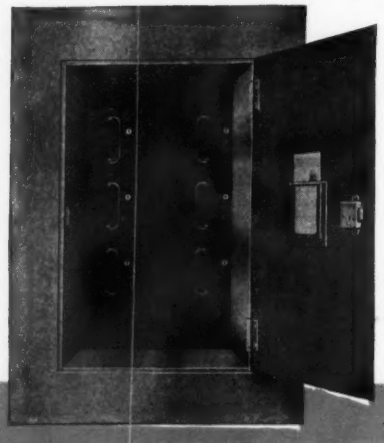
Note how fuse clamp switch blades, in ON position, make pressure contact with switch contact slots in the base. This draws the tips of the switch blades together, and pulls fuse clamps tightly around fuse ferrule. Contact parts are silver plated, for low resistance and long life. Bakelite barriers isolate each fuse in an individual compartment.

Each unit is equipped with FA solderless type pressure connectors; visible ON and OFF indicators; ventilating holes in fuse carrier; contacts for bus or cable integral with contact slot member, and pull handle for reversing switch.



FA PULFUZSWITCH units are made in 30, 60 and 100 ampere capacities, for 250 volts or less; also 30 and 60 ampere, 600 volts. They are assembled into panelboards (with either single or double row of branches) for all types of feeder systems. 60 ampere branches are convertible to 30 ampere—a desirable convenience for heat and power service.

Boxes are of galvanized steel. Wide gutters and FA Pressure type (Solderless) Connectors expedite wiring. Fronts are rust-proofed, and attractively finished in pearl gray. Available for both surface and flush mounting . . . For further information, write Frank Adam Electric Company, Box 357, St. Louis, Mo.



FA Pulfuzswitch Panelboard, double branch, with 60 amp. 3 pole branches.

EST. 1891 — THE SIGN OF A BETTER JOB

Frank Adam

ELECTRICAL PRODUCTS

for War Industry

FRANK ADAM ELECTRIC CO.
ST. LOUIS, MO. U.S.A.

Production Records Achieved In 1943 By Utility Industry

By C. W. Kellogg

President
Edison Electric Institute

THE YEAR 1943 has justified the optimistic predictions which the electric utility industry has consistently made as to its ability to supply the war load of the United States. No war program has been delayed by lack of electric generating capacity and, at the same time, full service has been maintained to the civilian population.

This year the long-time trends which have heretofore prevailed in the electric light and power industry have continued with little change. The 25 per cent increase during the year in the sales of industrial power measures the great expansion of the country's war production; but this class of service still comprises only 59 per cent of utilities' total sales, as compared with 56 per cent last year and 52 per cent six years ago, in 1937. Notwithstanding the complete stoppage of the manufacture of new household appliances and in spite of the various restrictions on the use of electricity in carrying out the National Conservation Program, the other uses of electricity have continued to grow at practically pre-war rates. Sales of electricity for household use show a gain of 2,000,000,000 kwhr over 1942 and small commercial service has grown by an equal amount.

This increased war and civilian load has been reflected in the largest gain in revenues in the history of electric supply, but none of this gain in revenue has reached the stockholder.

Tax Increases Cut Income

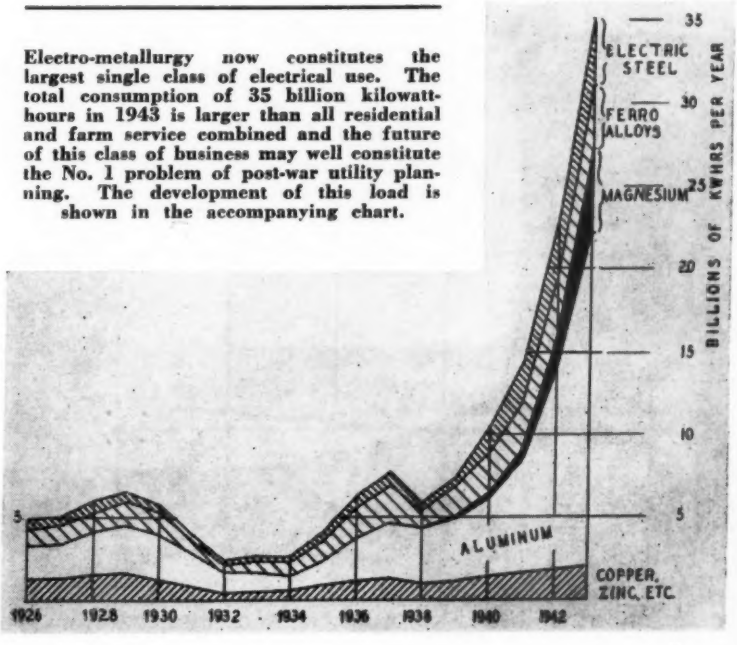
The consolidated income statement of the utility companies for 1943 will show a gain in gross revenues of $207,000,000 over 1942 to an estimated total of $2,816,000,000. According to financial reports published for the first ten months of the year (with November and December estimated) increased operating expenses and depreciation absorbed $138,000,000 of this revenue gain, while State and local taxes showed only a slight change. As a result, net income after all charges, but before Federal taxes, is expected to show a gain of $78,000,000 or nearly 9 per cent over a year ago. Federal taxes, however, have increased by $80,000,000, so that net income is reduced to $495,000,000 as compared with $497,000,000 for the previous year.

The total of all taxes—Federal, State and local—is estimated at $710,000,000 for the year 1943. This represents an increase of $80,000,000 or 13 per cent, which comes on top of an increase of 21 per cent last year. Since 1939, the taxes on electric utilities have doubled from $352,000,000 to $710,000,000 and now take one dollar out of every four collected by the utility companies from their customers.

Installed capacity in the public utility power houses increased during the year by more than 3,000,000 kw, bringing the total at the present time to about 49,500,000. During the past five years, generating capacity has grown by almost 11,000,000 kw, which increase alone is greater than the entire capacity of all the country's power houses at the beginning of the last war.

Since the nation's monthly war expenditures have shown little

Electro-metallurgy now constitutes the largest single class of electrical use. The total consumption of 35 billion kilowatt-hours in 1943 is larger than all residential and farm service combined and the future of this class of business may well constitute the No. 1 problem of post-war utility planning. The development of this load is shown in the accompanying chart.



change during the past nine months, it seems likely that the scale of America's gigantic industrial war effort has reached its climax and that the demand for electric power, even with the continuation of the most active field campaign, will be stabilized at approximately present levels. The installation of additional generating machinery is accordingly expected to taper off, with only 1¼ million kw scheduled for 1944 and one-half million in 1945.

Construction Expenditures Off

In 1943 the electric utility companies of the United States spent for new construction in round numbers, $265,000,000. This compares with a total of $456,000,000 in 1942 and a budget of $282,000,000 proposed for 1943 at this time last year. Construction expenditures for 1944, based upon budgets thus far announced, will approximate $225,000,000, or only slightly less than this year's actual construction. Much of this proposed expenditure is for distribution lines, a substantial part of which is destined to serve farms for increased food production.

Electric Utilities Gain 185,000 Customers in 1943

Classification	Number of Customers Dec. 31, 1943	Dec. 31, 1942	Net Change
Residential	26,817,700	26,620,456	+197,244
Rural	1,182,300	1,095,512	+ 86,788
Commercial & Industrial	4,285,300	4,369,385	— 84,085
All others	109,700	125,087	— 15,387
Total customers	32,395,000	32,210,440	+184,560

The largest changes among the individual states are a loss of 41,400 customers in New York (due largely to bi-monthly billing) and gains of 57,000 in California, 23,500 in Alabama and 16,000 in Michigan. The net gain of 184,560 during 1943 compares with a gain of 603,069 in 1942 and 1,416,370 in 1941.

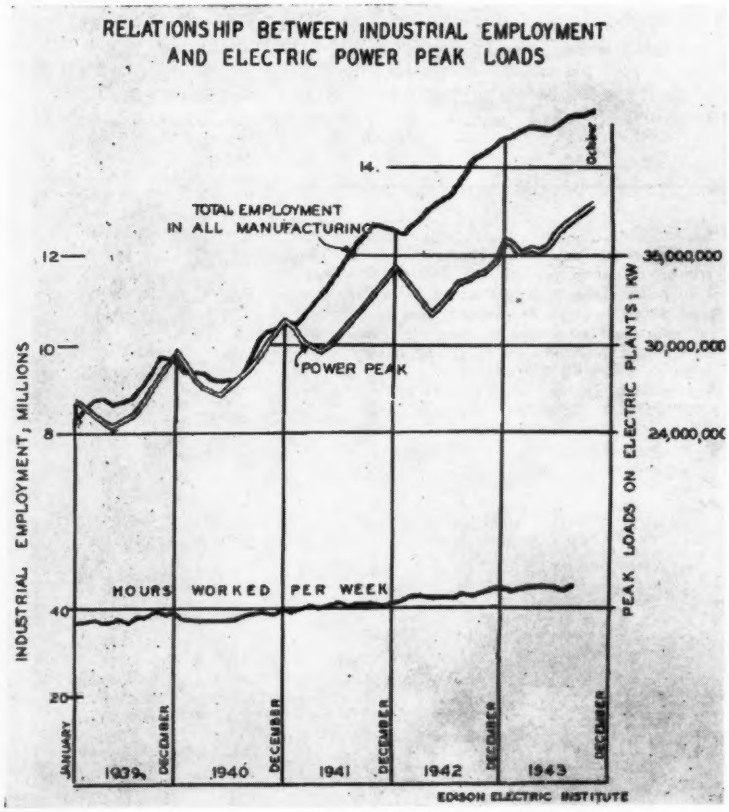
Comparison of Cost of Electric Service with Other Items Comprising "Cost of Living"

Classification	On Aug. 15, 1939 Index Number*	On Sept. 15, 1943 Index Number*	% Change, 4 Years
Food	93.5	137.4	47% Increase
Clothing	100.3	132.5	32% Increase
Rent	104.3	108.0	4% Increase
Fuel and ice	97.7	111.2	14% Increase
Housefurnishings	100.6	126.3	26% Increase
Miscellaneous	100.4	117.0	17% Increase
All Items	98.6	123.9	26% Increase
Elec. (25 kwhr)	96.6	94.3	2% Decrease
Elec. (100 kwhr)	97.3	96.1	1% Decrease

*"Index Numbers" are percentages of the 1935-1939 average.

The sum of the peak loads at the generating stations for December 1943, for all plants contributing to the public supply, is estimated to have been 41,000,000 kw. This is 4,300,000 kw, or 12 per cent, above the figure for last year and is 8,500,000 kw under the total installed capacity of the generating stations. In December of last year the corresponding margin of capacity above demand was 9,700,000 kw. During the most active year of the country's history and with the war production reaching its peak, the margin of the utilities reserves has thus been drawn upon by only 1,200,000 kw, or less than one-eighth of the total reserves.

For the group of larger (or so-called Class I utilities) reporting to the Institute, the sum of the noncoincident peak loads for December is estimated to have been 37,000,000 kw, as compared with 32,942,000 in December of 1942. This figure of 37,000,000 for these larger systems is about 3 per cent below the estimate made by them a year ago and is nearly 6,000,000 kw below the forecast of 42,732,000 made by the Federal Power Commission in July, 1941, at the height of its "power shortage" campaign.



Output Up 17 Per Cent

Output of electricity in 1943 by all agencies contributing to the public supply totaled approx-

(*Continued on page 66*)

OPA Allows Higher Prices For Appliance Servicing

SO THAT there may be an adequate supply of repair and maintenance services for mechanical, electrical and gas equipment and appliances used in the home, in hospitals, hotels, schools and business places, the Office of Price Administration has issued a special regulation that enables some suppliers to increase their prices.

In normal times a great deal of such service is rendered at or below cost as an accommodation to customers, in order to build good will leading to purchases of new equipment from the supplier, OPA said. In other instances, repair and maintenance is the chief feature of the suppliers business, but increases in labor costs for skilled mechanics since March, 1942, call for adjustment of customers' prices if suppliers are to be able to continue in business. Ceiling prices at March, 1942, levels, which have obtained until now, do not take into account either of these circumstances.

While this new regulation will result in higher prices for repair and maintenance service in a number of cases, it will help to assure continuance of such services and thus to keep in operation equipment now being used by consumers in the almost total absence of available new equipment or appliances, OPA said. The war has caused the virtual stoppage of new manufacture of such commodities for civilian use.

The new regulation enables suppliers who charge on the basis of a customer's hourly rate, to continue charging at their highest March, 1942, prices, if they choose, but offers alternate methods of determining ceiling prices.

The alternate methods are calculated to afford a margin over direct labor costs that is comparable to that generally obtained in the automotive and farm equipment repair field. They are stated by OPA to afford prices that are fair and equitable, and in compliance with the Emergency Price Control Act of 1942.

A supplier of the services who employs mechanics may now choose one of four ways for use in establishing his maximum hourly charges to the customer. The four methods are:

(1) Charge the highest customer's hourly rate that the seller charged in March 1942.

(2) Charge the customer for each hour of service a price that is double the average basic hourly wage rate paid on October 3, 1942, to employees performing the particular type of service. (October 3, 1942, is the date when wage rates were stabilized under the Economic Stabilization Act.)

(3) Charge the customer 60 cents more per hour of service than the average basic hourly wage rate paid on October 3, 1942, to employees performing the particular type of service.

(4) If the supplier employs no more than eight employees, and is exempt from wage control by the National War Labor Board, add to the customer's hourly rate determined under either 2 or 3 above, an amount equal to the increase since October 3, 1942, in the average straight-time hourly rate for mechanics performing each type of service. (A price established on this basis may not be changed oftener than once in 30 days.)

A person who does not have any employees may use either one of two methods to determine his charges, as follows:

He may charge the highest hourly rate that he charged in March, 1942, for the same service to a purchaser of the same class, or

He may charge the maximum hourly rate that is charged by his most closely competitive seller who does employ mechanics to perform the service.

The regulation provides certain permissible minimum charges for service calls. It also specifies record-keeping requirement, and calls for the furnishing of invoices to purchasers. Details of these requirements are set forth in the text of the regulation.

REGULATION*

(Document No. 25665)

PART 1499—COMMODITIES AND SERVICES

[MPR 188,[1] Supp Service Reg. 22]

REPAIR OF CERTAIN APPLIANCES AND EQUIPMENT

A statement of the considerations involved in the issuance of this Supplementary Service Regulation No. 22, issued simultaneously herewith, has been filed with the Division of the Federal Register.* For the reasons set forth in that statement and under the authority vested in the Price Administrator by the Emergency Price Control Act of 1942 as amended, and Executive Orders Nos. 9250 and 9328, Supplementary Service Regulation No. 22 is hereby issued.

§ 1499.674 *Maximum prices for repair of appliances and equipment*—(a) *General rule.* Any person engaged in the repair or maintenance of appliances and equipment (as defined below), who uses a customer's hourly rate to determine his maximum prices, shall determine his maximum customer's hourly rate for such services by any one of the following methods:

(1) He may charge the highest customer's hourly rate actually charged by him in March 1942 for the same service to a purchaser of the same class; or

(2) He may multiply by 2 the average basic hourly wage rate (as defined below) paid on October 3, 1942, to employees performing the particular type of service; or

(3) He may add 60¢ to the average basic hourly wage rate (as defined below) paid on October 3, 1942, to employees performing the particular type of service

(4) He may, if he employs a total of not more than 8 persons and if wage increases paid by him have been exempted from the provisions of Executive Order No. 9250 by the National War Labor Board and do not violate any regulations of that Board, add to a customer's hourly rate determined under subparagraph (2) or (3) an amount equal to the increase since October 3, 1942, in the average basic straight-time hourly rate for mechanics performing each type of service. Adjustments under this subparagraph (4) may not be made more often than once every 30 days.

(5) Where the rates under subparagraph (2), (3), or (4) are not divisible by 5¢, they may be adjusted upward to the nearest amount so divisible.

(b) *Rule for persons having no employees.* Any person subject to this regulation who does not employ any mechanics to perform such work may determine his maximum customer's hourly rate for repairing appliances and equipment by either of the following methods:

(1) He may charge the highest hourly rate which he charged in March 1942 for the same service to a purchaser of the same class; or

(2) He may charge the maximum hourly rate of his most closely competitive seller who does employ mechanics to perform the service.

(c) *Minimum charges for service calls, etc.* Minimum charges and mileage rates may not exceed the March 1942 minimum charges and mileage rates to the same class of customer, except that any minimum charge made in March 1942, which was based upon a stated minimum of time, may now be based upon the same minimum time applied to the hourly charge permitted by this regulation.

(d) *Records.* Any person who increases his prices under this regulation shall prepare a statement setting forth:

(1) His maximum customer's hourly rate for each type of service;

(2) The name and address of every employee who was engaged on October 3, 1942, in performing appliance and equipment repairs. (Show what type of service was performed by each employee; do not list clerical, supervisory and nonproductive employees.)

(3) The hourly wage rate paid on October 3, 1942 to each employee so listed;

(4) In the case of sellers adjusting their prices under paragraph (a) (4), a statement of the hourly wage rate of each employee, on the date of any price increase made under this regulation.

(5) A reference to the paragraph of this regulation under which he has computed his ceiling prices.

This statement shall be retained in the seller's files and may be inspected by the Office of Price Administration. A signed copy of the statement shall be filed with the seller's local War Price and Rationing Board on or before the date of any price increase effected under this regulation. No price increase hereunder shall be lawful until such statement has been filed.

(e) *Invoice.* Any person subject to this regulation shall, upon request, furnish the customer with an invoice for such service, separately showing the hourly rate for the service rendered to the customer, the number of hours worked and any charges made for parts and materials.

(f) *Posting.* When a price is increased as authorized herein, the seller shall post conspicuously in his place of business a notice setting forth his new maximum customer's hourly rate for each service involved. This notice shall be posted in the following form:

CEILING PRICES FOR LABOR

Service	*New hourly rate*

(g) *Definitions.* (1) "Appliances and equipment" means mechanical, electrical or gas appliances commonly used in homes, hospitals, hotels, institutions, offices, retail establishments or schools, including but not limited to electric fans, lamps, refrigerators and refrigerating equipment (up to 25 h.p.), water coolers, air conditioners (up to 25 tons capacity), sewing machines, vacuum cleaners, washing or ironing machines, commercial or domestic kitchen equipment, radios and phonographs (not primarily designed for commercial, military or police use), and stoves. The term does not include gas unit heaters, furnaces, industrial equipment, water heaters, oil burners, typewriters, adding machines, dictating machines, duplicating equipment or other office machines.

(2) "Average basic hourly wage rate" is a rate determined as follows: Add together the straight-time hourly wage rates of all productive mechanics (excluding supervisory and clerical employees) regularly engaged in performing a particular type of service. Divide the sum of these by the number of such mechanics employed. This will give you the average.

This supplementary service regulation shall become effective December 27, 1943.

NOTE: The reporting and record-keeping requirements of this regulation have been approved by the Bureau of the Budget, in accordance with the Federal Reports Act of 1942.

Issued this 20th day of December 1943.

CHESTER BOWLES,
Administrator.

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*Copies may be obtained from the Office of Price Administration.

[1] 7 F.R. 4734, 5022, 5857, 6438, 6566, 8289, 9431, 8706, 9043, 9048, 9197, 9343, 9345, 9789, 9971, 9972, 10480, 10619, 10718, 11010; 8 F.R. 1060, 3324, 4782, 5461, 5755, 5933, 6364, 8000, 8973, 10671, 10899, 11754, 12028, 12710, 13003, 13472.

The regulation affects electric fans, lamps, refrigerators, refrigerating equipment up to 25 horsepower, air conditioners up to 25 tons capacity, sewing machines, vacuum cleaners, washing and ironing machines, kitchen equipment and appliances, radios and phonographs, and similar articles. It does not, however, include gas unit heaters, furnaces, industrial equipment, water heaters, oil burners, typewriters, adding machines, dictating machines, duplicating or other office equipment.

OPA said that it soon will issue a Services Trade Bulletin explaining in detail the steps to be taken and providing a convenient form for making the necessary computations in adjusting prices. The regulation is designated as Supplementary Service Regulation No. 22 to Maximum Price Regulation No. 165, as amended, Services. It is titled Repair of Certain Appliances and Euipment, and is effective December 27, 1943.

New Basis Announced for Overtime Service Charges

TWO METHODS that may be used by service shops in the various repair trades in setting charges to customers to offset increased costs resulting from the payment of overtime wage rates were outlined recently by the Office of Price Administration.

They apply to all suppliers of services whose prices are based on an hourly charge to customers for labor under the terms of the Services Regulation (No. 165).

This action was made necessary, OPA said, because of the decided trend in the repair business toward a lengthening of the work week and the payment of overtime wages beyond the first 40 hours. The 48-hour week has been made mandatory in many areas by rulings of the War Manpower Commission. In many other cases it has been adopted voluntarily in order to use available workers more efficiently. Charges for most repair services were frozen generally at the March, 1942, level. In authorizing an increase in customers' rates where overtime service is provided, OPA has recognized the problem that added overtime costs have imposed upon many establishments.

A choice of two pricing methods is now allowed to shops with mechanics working 48 hours a week who are paid at overtime rates for the last eight hours.

First, an additional charge is permitted for work done in overtime hours, which may bear the same ratio to the regular hourly charge that the overtime wage rate bears to the regular wage rate, providing the customer requests this overtime service and is willing to pay extra for it. Thus, if a shop pays time and half for overtime it may charge 1½ times its regular charge for work done in overtime hours, providing this is agreeable to the customer. Under the same conditions, if it pays double time for overtime, it may charge double the regular hourly rate for overtime work.

This method does not always work out well in practice, since it is not easy to determine exactly which hours in a work week are to be considered as overtime hours. For example, some shops now work one hour longer for 5 days of the week and remain open 3 hours longer on Saturday. Under these conditions it is obvious that many jobs that were started in regular hours will need some part of the overtime period for their completion. OPA recognizes that this makes the pricing of overtime work extremely difficult, particularly so when it also involves securing permission from the customer before the extra charge is made. To overcome these difficulties and at the same time to permit these establishments to absorb the additional costs a second method is permitted.

Under the second method, an upward adjustment of the regular customer's hourly charge may be made in an amount that approximately represents the additional overtime cost.

Where overtime is paid for at 1½ times the regular rate, shops with customers' hourly charges under $1.75, may increase the hourly rate by 5c. Those whose hourly charges range from $1.75 to $3.49 may increase the hourly rate by 10c. Those whose hourly charges are $3.50 or more may increase the hourly rate by 15c.

In exceptional cases, where the eight hours of overtime are paid for at double the regular rate, permissible increases are 10 cents on hourly charges below $1.75, 20 cents on charges from $1.75 to $3.49, and 30 cents on charges of $3.50 or more.

A shop must choose one or the other of the two methods for all work done within a 48-hour week, and cannot use both for that period. However, it may use the second method for 48 hours, and the first method for any additional overtime hours beyond 48. This has been permitted, OPA explained, because overtime work done in any period beyond 48 hours is usually of an emergency nature, and the customer would normally expect to pay for it on that basis. The regulation is designated as Supplementary Service Regulation No. 21.

REGULATION

(Document No. 25663)

PART 1499—COMMODITIES AND SERVICES

[MPR 165,[1] Supp. Service Reg. 21]

CHARGES FOR OVERTIME WORK

A statement of the considerations involved in the issuance of Supplementary Service Regulation No. 21 has been filed with the Division of the Federal Register.* For the reasons set forth in that statement and under the authority vested in the Price Administrator by the Emergency Price Control Act of 1942, as amended, and Executive Orders Nos. 9250 and 9328, Supplementary Service Regulation No. 21 is hereby issued.

§ 1499.673 *Charges for overtime work.* Persons performing services covered by Maximum Price Regulation No. 165, whose maximum prices are based upon a customer's hourly charge for labor, may increase such hourly charges in accordance with this regulation when their employees directly engaged in performing such services work overtime and are paid for overtime work at overtime rates. The following rules shall apply:

(a) *When customer requests overtime work.* Persons covered by this regulation may make an additional charge for work done at overtime wage rates in overtime hours if the customer actually requests that the work be done in overtime hours and agrees to pay the additional charge. The ratio of the overtime charge to the regular charge shall not exceed the ratio of the overtime wage rate to the regular wage rate; i. e., if overtime wages are one and one-half times regular wages (time and one-half for overtime) the overtime customer's hourly rate may be one and one-half times the regular customer's hourly rate. This paragraph shall not apply with respect to charges for work done in any overtime hours which have been taken into account for the purpose of increasing hourly rates in the manner authorized by the next paragraph.

(b) *General rule for 48-hour week including 8 hours overtime.* Persons whose employees directly engaged in performing such services regularly work 40 hours a week at straight-time rates and 8 or more hours at overtime rates may add the following sums to their maximum hourly charges established under Maximum Price Regulation 165:

Where overtime is paid for at 1½ times straight-time rates—5 cents per hour to any hourly charge under $1.75, 10 cents per hour to any hourly charge from $1.75 up to but not including $3.50 per hour, 15 cents per hour to any hourly charge of $3.50 or over.

Where overtime is paid for at double straight-time rates—10 cents per hour to any hourly charge under $1.75, 20 cents per hour to any hourly charge from $1.75 up to but not including $3.50, 30 cents per hour to any hourly charge of $3.50 or over.

(c) Except as otherwise provided by this regulation, Maximum Price Regulation No. 165, as amended, remains in force.

This supplementary service regulation shall become effective December 27, 1943.

(56 Stat. 23, 765, Pub. Law 151, 78th Cong.; E.O. 9250, 7 F.R. 7871, E.O. 9328, 8 F.R. 4681)

Issued this 20th day of December 1943.

CHESTER BOWLES,
Administrator

*Copies may be obtained from the Office of Price Administration.

[1] 7 F.R. 6429, 6946, 8239, 8451, 8792, 8943, 8946, 9197, 9342, 9343, 9785, 9971, 9972, 10480, 10819, 10719, 11010; 8 F.R. 1060, 3324, 4782, 5681, 5755, 6833, 8606, 8673, 10671, 10939, 11784, 12023, 13710, 13802, 13472.

Underage Boys — Overage Men Solve Shop Labor Problem

By L. H. Houck

NOT every motor shop finds it practical to hire women to replace men called to war. Not every shop can successfully work women—it requires special teaching and special facilities.

The Laycock Armature Works, Tampa, Florida, of which Harold Laycock is manager, has largely solved their war-time labor problem by teaching the trade to underage boys and overage men.

Selecting applicants by age bracket is certainly no panacea for today's labor evils but the way it is handled at Laycock's make it the answer for the medium sized shop who wants to keep away from the employement of women.

One of Laycock's new boys, James Green, whose previous mechanical experience was limited to bicycles and Fords, went into production the first day and wound an acceptable armature at the end of his first week.

After more than a year's experience, Mr. Laycock has evolved a workable system with an exceptionally low ratio of failures.

Applications are accepted only from age groups above the draft age and under draft age. Often a man sixty years old without previous experience can become productive in a few days, Mr. Laycock reports.

Questionnaire Found Helpful

Each applicant fills out a questionnaire giving his complete personal history and educational background. This application is turned over to a professional credit checking bureau where the applicant is checked for everything from elementary schooling to loyalty to his country.

Only those endorsed by the credit agency as good citizens and with good school and employment records are accepted. They must be satisfactory to employ in war industry.

Applicants accepted are divided into two groups. Those with mechanical experience are placed in the repair group and those without mechanical experience are placed in the rewinding division.

An applicant accepted for the repair division must be mechanically inclined and like mathematics.

"You can almost always tell what you can do with a man by what he likes in school," Mr. Laycock said.

In the repair department every accepted applicant becomes productive from the first day because he is started at the cleaning tub. Here he learns to wash the grease and grime from motors to be repaired, learns the names and uses of the various parts, sees the unit disassembled.

"It is to the best interest of the employee as well as the employer," Mr. Laycock said, "that he be advanced as fast as he learns. The next step from the wash tub is soldering commutators and small repairs. It is essential that the learner be given only work which can be checked during this stage."

As the learner progresses some system of increasing his earning capacity must be worked out, which would vary with the size of the shop and local conditions.

Learners at the tub are also impressed with the importance of taking care of all small parts. They are taught that if they lose a part it must be either bought or made and that the time lost hunting it not only delays repair and delivery of the unit but costs money and creates unnecessary waste.

"He must be pushed along as fast as possible to keep him from losing interest," Mr. Laycock said.

His immediate goal in the repair department is to become a trouble man and so he is taught judgement and caution as well as

Mr. Laycock, Sr., shows a youngster how to put on a commutator. In the Laycock Armature Works, boys of 16 and 17 are being taught motor rewinding work and utilized profitably.

George Smythe, (left) has three and a half years experience, and now instructs new recruits. All start in at the wash tub where they learn cleanliness and names and uses of the motor parts.

technical details of trouble shooting. He must be impressed with the fact that often the lives of his customers are in his hands since leaving high tension leads open or machines grounded may cause fires or accidents.

Previous to the use of the comprehensive questionnaire, more than fifty per cent of the applicants employed had to be released because of one or several kinds of unsatisfactory characteristics. Since use of the credit checking agency and the application form was begun, nearly all applicants are satisfactory and only leave the employ of the company for personal reasons.

Another point of the system is to teach the learners only one operation at a time. It has been common in the industry to try to give learners a background of the whole business.

By teaching the learner only one operation at a time, he becomes productive in some degree almost immediately and thus makes his employment an economically sound proposition.

Learners start at 16 years because the law provides that age minimum for employment around moving machinery. The 16-year-old boys can obtain part time work and go to school. In fact, those who wish to keep up with school work are preferred, where they do not let the work interfere with their studies. Boys of this age need to be watched, according to Mr. Laycock, to see that they don't saddle themselves with too much of a load.

Older men and physically handicapped men who have never had any previous mechanical experience may be profitably employed. Most of these fit into the rewinding department, it has been found.

R. M. Bates, 63 years old, rewinds single and three phase field coils without having had previous experience. He likes the work and takes pride in his production.

The case history of James Green, 17, who has been winding coils for a year, is of interest. He produced an acceptable armature winding at the end of his first week. His previous experience was limited to tinkering with automobiles and bicycles. He likes to work on motors.

Charles Butler specializes in stator windings after one year experience. His previous interest was model airplane construction.

Charles Butler, now with a year of experience and about the same age as Green, built model airplanes up to the gas models where he found his hobby getting too expensive. He had tried to take an NYA electricity course but the school closed down before his application was accepted. So in learning to wind coils at Laycock Armature Works he is fulfilling an earlier ambition.

"Too much time and care cannot be spent in selection of the right boys from the list of applicants," Mr. Laycock said. "Here is where you can save 90 per cent of your trouble. You want boys with ambition and a yen to learn —not coasters. In old men, you want clean cut oldsters who are sincerely interested in learning some mechanical job that will occupy their hands and their minds and bring in a little income as well.

"You need to know as much as you can about the reason they want to work."

R. M. Bates, 63 years old, one year experience, now winds field coils both single and three phase. Harold Laycock, right, manager, checks the work.

LAYCOCK ARMATURE WORKS

EMPLOYMENT APPLICATION FORM

Date_____

Print your full name_____ Age_____

Present Address Street_____ City_____ State_____ Phone_____

Date of birth_____ Weight_____ Height_____

Are you married or single?_____ Number of Dependents_____

Are you a U. S. Citizen by birth_____ Naturalization_____

Mention all physical or chronic disabilities_____

Schooling	Date of Entering	Date of Leaving
Elementary		
Junior High		
Vocational or Trade		
Business or Technical		
College or University		

Job applied for_____ Years of Experience_____

Please list last two places of employment.

1. Present or Last Employer_____ His Address_____

Date started_____ Date left_____

Why did you leave?_____ Your occupation while there_____

2. Next previous Employer_____ His Address_____

Date Started_____ Date Left_____

Why did you leave?_____ Your Occupation while there_____

Give three personal references.

1. Name_____ Address_____
2. Name_____ Address_____
3. Name_____ Address_____

Indicate in space below any other additional information which you consider important:

Signature_____

Social Security Number_____

Date_____

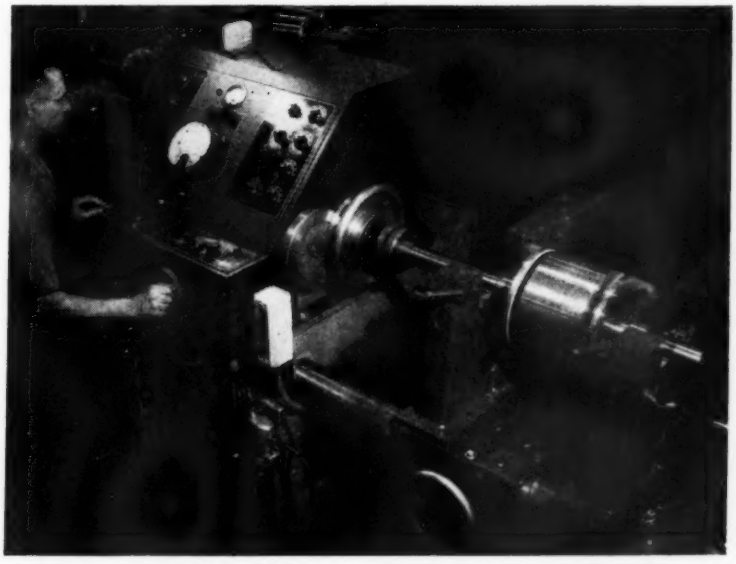
Shown here are both sides of the questionnaire used by the Laycock Armature Works in interviewing prospective employees for their shop. By learning the hobbies of the boys and older men who apply they have been able to select satisfactory employees.

Mr. Laycock is no novice at teaching. He is an official pistol instructor for the Coast Guard, giving them twelve hours a week of his time and for many years has been identified with gun and pistol clubs.

Dynetric Machine for Balancing Armatures

UNBALANCE of armatures can be located in 1-8 to 1-10 the time required for mechanical balancing with this dynetric balancing unit used by Westinghouse at East Pittsburgh. It is possible to precision balance armatures for 50 hp to 200 hp motors to 1-10,000 of an inch of linear movement.

The operator proceeds as follws when he balances an armature: (1) Places the shaft of the armature in floating bearings. (2) Connects the armature shaft to that of a motor driven sine wave generator. (3) Adds a known weight of molding clay to one end of the armature at the 0 reference point of the sine wave generator index wheel. (4) Rotates armature at 600 rpm. (5) Manually adjusts sinewave generator until the rotor is in phase with the stator, at which point the armature is in balance with the machine. (6) Weight of metal necessary to bring one end of the armature in balance is read on the scale of the large instrument in center of panel. The horizontal movement of the armature, due to vibration, is transmitted by the floating bearings through a mechanical connection to an electrical coil whence it is electrically transmitted to electronic tubes which amplify the unbalance so it can be recorded by the instrument. (7) Sine wave stator index wheel indicates place on armature with respect to 0 reference point of the sine wave generator index wheel where the weight that was read on the instrument must be added to bring that end of the armature in balance. The operator then repeats these steps for balancing the opposite end of the armature.



The new dynetric balancer is shown in operation here balancing an armature. It is said to reduce balancing time tremendonsly.

Customer Education Activities Occupy Duke Service Staff

By H. M. Trotter

THE DUKE Power Company, with its numerous branches scattered over a large part of North Carolina and South Carolina, is working hard at its headquarters in Charlotte and in every branch to help its customers take care of the electrical equipment they have and to give them good service even though manpower and supply shortages create terrific problems.

Education is the best answer they have found to the problem of keeping this phase of the business going satisfactorily, and thus a greatly expanded program designed to teach the customers how to take care of the appliances they have now, while at the same time impressing upon them the advantages of their wise use, is being carried forward under the direction of experts.

In regard to post-war planning for adequate wiring, little of concrete nature is being done for, as Roy Palmer, advertising and merchandising manager says, it is a bit too early to get down to details on this problem for the end of the war is likely to bring new developments in wiring that would make obsolete any plans made now.

There is one phase of postwar planning, however, Duke Power Company executives consider most important and they are losing no opportunity to lay the groundwork for real progress here. This is a phase brought on by the war and its resultant scarcities. Many persons have more money than they have ever had before. This makes them want to buy things that they thought they could not afford before — such as electric ranges, electric washing machines, electric ironers, and various appliances that make housekeeping easier. Because they cannot buy them, they want them more and more and Mr. Palmer expects that when the war is ended and these are on the market again, there will be a great wave of buying by persons who have bought war bonds to provide the money needed for them. With thousands of families throughout the country anxious for added electrical conveniences, architects and contractors planning now for houses to be built as soon as restrictions are lifted should be convinced of the necessity of planning for and providing outlets of the proper size to take care of these appliances. Mr. Palmer believes this is the principal phase of post-war planning that his company can work on at the present time and thus is stressing its importance.

Present and Future Benefits

Much time is being given in the field of customer service with the idea of both present and future benefits. The company knows that its customers must take care of what they have if they are going to enjoy the benefits of their electrical appliances for the remainder of the war period. Education is the means used here, although several methods are taken in order that as many persons as possible can be reached.

One of the most effective ways of serving the customers is through the home service department in which a group of well trained home economists is kept very busy working with the women in the Duke company's territory in the Carolinas. These experts give demonstrations to clubs and other organizations of women in cooking, canning, and other subjects which interest the women. But added to these demonstrations is the subject, vital in time of war, of conservation of electrical equipment.

The methods of taking care of ranges, refrigerators, washing machines, irons, and toasters are taught to the women who attend the meetings and the result is that these appliances will have longer life. The women are urged to take care of their iron cords, to cut off the iron when they run to answer the telephone, to be careful that the iron isn't dropped, and to take numerous pre-

Mrs. Lula Austin, of the Duke Power Company's staff, at Hickory, N. C., is shown at her desk ready to answer questions on nutrition or the care of electrical appliances for any person who wishes to come in and talk with her. The company finds that the work of such experts in their offices and in classes is accomplishing much toward conservation of the appliances.

cautions to keep their appliances in good order.

The company has found that the women who attend these meetings go home and tell their families and friends what they have learned and much is accomplished toward the goal of conserving the appliances that are now owned and used by the public.

Home Service Consultation

The work of the home economics experts, however, does not end with conducting meetings. They have office hours during which customers may call on them and ask any questions about the care of their ranges or refrigerators that are bothering them. On the whole, the program is extensive and keeps the women teachers very busy but it brings results that would be welcomed by any concern trying to serve its customers in war time with vastly diminished supplies.

Women learn about food and electricity at the same time. This is one of the numerous classes conducted in the Duke Power Company's educational program, classes which not only result in better health for families of the women who attend but which also bring dividends to the company through the information that these women get on care and use of their appliances.

As is probably true of all companies serving the public, the Duke Power Company has a manpower problem and a problem of shortages in automobile and truck tires and gasoline. In spite of this, Mr. Palmer says his company is being able to keep up a good service record although it has taken and continues to take a great deal of planning and education to make this possible.

Of course, the first step is taken in the service department where the servicemen repair appliances which before the war would have been discarded. Those that appear to be beyond repair locally are sent back to the manufacturer to see what can be done. When the matter of handling repairs that are brought in is taken care of, there still remains one that is tremendously more tedious —that of satisfying the demands of customers who find something has gone wrong and want a service man to come right out and fix it. This means extra time spent when workmen are very scarce and it means, too, that precious gasoline and tires are used to travel mile after mile when it all might be avoided.

The work done by the women in the home economics department pays big dividends here but there are still many loose ends to be tied up in educating the public. A fruitful plan used in a number of the branches consists of demonstration boards which are used to teach customers what they should know about fuses and how to make fuse replacements with their own hands. The demonstration board shows the customer why a fuse blows out, what it is, where it can be found, and how to change it.

Demonstration Board Helpful

Charles M. Stone, appliance supervisor of the company's merchandising department, explained that the demonstration board has been used, too, at a number of group meetings. When such a meeting is held, attended by 40 or 50 women who are leaders in their communities, information is given out which can be passed along to their neighbors and can thus save the servicemen a great deal of effort on simple jobs that any layman, who studies the problem just a little, can do himself.

At one of the branch offices, another profitable plan has been devised. At the close of each day, the service department makes a list of the service calls which were received on fuse replacements and places in the mail a form letter to each of these customers explaining the method of changing fuses. In a period of only five weeks, 140 of these letters were mailed and this many service trips, that would have been made before the war emergency, were saved for the department.

The branch offices have also been conducting a series of meetings with the purpose of reducing service trips through the proper use of the telephone. Every person employed in the branch attends these meetings where the fact is emphasized that while the company is striving to give even better service than it has done in the past, the customer is being given an opportunity to help the company in trying to conserve gas, tires, wear and tear on nonreplaceable equipment, and valuable manhours.

Special Advertising Program

Probably one of the most vital helps to the company, however, has been the special advertising program that has been conducted through newspapers. With the slogan that electricity is vital to the war and should not be wasted and with the use of eye-catching art, the advertisements give to the housewife and to her husband valuable information that will help them to preserve their electrical appliances for long use.

The advertising department spent a great deal of time on these advertisements and the results have been good. One gives advice on how to "keep your refrigerator young" and points out that electric appliances, like people, can get old before their time, that a refrigerator can be helped to do its best job by giving it a little care—and that it must last—no

(*Continued on page 64*)

"Labor Your Best Commodity —Sell It At a Profit"

By Chas. N. Tunnell

LABOR, especially during the war emergency, is the main thing the electrical repair shop operator has to sell, so he must make a profit on this labor. Before the war many repair shop owners sold a few motors, switch panels and such things and did a little horse-trading to make some extra money. But now a lot of these operators are finding it better business to forget the sale of used equipment and stick to rebuilding and repairing exclusively.

This advice comes from William M. Payne, who has built up a successful electric repair shop for industry. Volume, and volume at a profit, for 1943 is 60 per cent ahead of 1942. Mr. Payne owns the Payne Electric Works, at 1109 Jackson Street, Houston, Texas. His experience dates back to After the war, he graduated from Naval Electrical School, in 1910, and spent 9 years in the Navy. World War I, Mr. Payne left the Navy with the rank of Warrant Officer in the electrical department of a battleship. He followed the electrical motor repair trade in the early twenties, and opened his own shop in Houston. The shop has been moved to new and larger quarters on several occasions to take care of a growing business.

"We used to buy and sell some second hand motors and rebuild motors, but since the war, we have found it more profitable to stick to customer service exclusively. We used to be able to put a 40-cent-an-hour boy on rebuilding a small motor, a motor that probably cost only $6.85 when new, and either make a profit on the repair for the customer or make a profit on the resale if we owned the motor. Ceiling prices will not permit us to make a profit on the sale of used equipment with labor prices such as they are—but we can charge our regular labor rates to the repair of any motor for a customer and make a profit on this labor. The small motor that costs but $6.85 new may require $14.50 in labor and parts."

This shop owner explains another phase of wartime operations with this: "If we were to sell used motors, we would have to have a license; then clear all priorities through Washington and take on a lot more bookkeeping, actually have two sets of books instead of our present one, so we find it more profitable to stick to labor and repair parts."

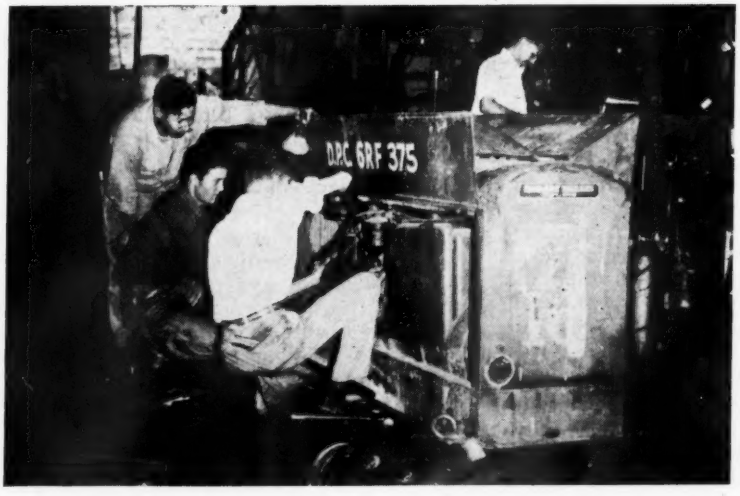
Specialize in Industrial Work

The Payne Electric Works handles industrial work and commercial work exclusively. This firm does not even repair fans any more unless it is a special favor to some customer of long standing. An average of 18 electricians and their helpers are employed; the shop actually needs 30 or more electricians.

"We just can't take all the work we could get," says this executive, "so we accept work in this order. Old customers first, war jobs second, and new customers third. Of course 75 to 90 per cent of all of our work is war work—we do a lot of work for the shipbuilding and other war plants; then we do much work for the many smaller firms handling sub-contracts or processing materials, etc., for the war plants. Then, too, we consider food plants and such commercial firms as essential—and we handle emergencies in the order of their importance. Of course, we are regulated by priorities as to turning out a repair or rebuilding job; but nevertheless, we consider an ice plant, dairy, bakery, or packing house as a vital part of our war program and we handle such emergencies immediately.

"One thing in particular we have learned: we don't make promises about delivery. We simply tell our customers what we hope to do and that we will handle the job just as rapidly as labor and materials are available. We can give two weeks service on many jobs, but some require months. Many motors, welding outfits and numerous other industrial equipment pieces are waiting around for repair parts. But on the whole, we have fared well in getting parts and replacements necessary."

With the quantity and quality of manpower short today under wartime conditions, some electrical repairmen hesitate at watch-



Electricians in the Payne Electric Works, of Houston, Texas, all specialize—some on welding equipment, large motors, small motors, etc.

ing all corners to pass along all labor charges to the customer. Mr. Payne says, "This must be done now. Of course we comply strictly with the ceiling on labor prices; but with nothing but labor and repair part to sell, we must be sure that we get paid for our labor. If we have a man on a job at $1.25 per hour, we charge the customer $2.50 per hour—and we have a minimum service charge of $2.50 even though it is but 5 minutes to put in a fuse. It is not the time on the job that always counts but the time in getting off one job to another and back again.

"We operate three pick-up trucks and keep one trouble shooter for this work exclusively. We keep three men on small motors exclusively and a number of them on big motors exclusively, while other men specialize on welding equipment. In this way we try to get maximum efficiency from the men; but on the whole, the production per man hour is below pre-war. We pay 5 cents an hour more than the shipyards for electricians, but a low grade electrician can get first class rates in the war plants and we have to maintain a high quality standard and turn out as much production as possible per hour.

"We run into a lot of over-time, but we don't drive our men. We don't demand that they do overtime work, but for all emergencies, we ask them to do it and they do. Our men are over-worked and frankly had rather have the rest than to have the over-time. We charge over-time on all work after 4:30 p. m. and for Sundays and holidays. We keep the shop open until 10 p. m. daily. In case of an emergency, I can be called at home, which I don't encourage, and in turn I can get a crew on a real emergency. But for all night work after the man has gone home, we charge double time.

"We make a charge for the use of our trucks and for any special service. But we have not changed our policies any since the war. We still guarantee a motor that has been completely overhauled for a full year, and when we turn it out it is as good inside and outside as a new motor.

"Paint is still obtainable. We can buy machinery enamel; but we can't get shellac. We do, however, get a good substitute for shellac; and every job goes out of the shop looking like a new piece of equipment. A little cleaning and painting is a mighty cheap way to improve appearance; and even the industrial engineer or commercial customer appreciates good appearance in equipment.

Eyes on Postwar Business

"We have never done anything but serve the electric field; we expect to continue in this field after the war. We know that our customers are having to pay much more for service than formerly; but we, too, must pay more for labor and parts. We don't assume any 'like it or else' policy in this business for we take the time to be friendly and to explain to customers about our service and our prices. We watch all jobs closely and try to catch any error before it is made, but this is not always possible with the skilled workmen that are available. Our percentage of jobs that must be done over is greater than pre-war times, but we still hold this percentage very low."

The Payne Electric Works has never been a firm to try and corner all of the electric repair work.

"We take on new customers even now," says Mr. Payne, "but only as we can give them good service and only after taking care of the people whom we have been serving. We don't have any get-rich ideas about this business; but it is a good business, and we are making a reasonable net profit on our operations. Our volume in 1942 was ahead of the previous year, totaling $50,000. Our 1943 volume is approximately $80,000 for customer service—but of more importance than the net profit that we have been able to make on this business is the fact that this is volume which we have handled to the satisfaction of our customers and in such a way that we will continue with an orderly and profitable business when Victory comes."

William M. Payne, center, shows one of his electricians how to repair a small motor. Three men devote full time to this class of work.

Lead-Coated Steel Instead of Brass

THAT use of "alternate" materials does not necessarily mean impairment of quality is shown by the way in which lead-covered steel is doing a better job than did copper or brass in the manufacture of a small part for electric motors.

Rotors of certain types of motors were previously equipped with such banding rings of either copper or brass, solely so that the rotor could be dynamically balanced by applying drops of solder to the band as required. Solder would adhere easily and tightly to either metal.

Solder likewise clings tightly to lead, so by changing to bands made from lead-coated steel, several thousand pounds of copper and brass have been conserved. In addition, because of the greater tensile strength of the steel, the weight of the band has been reduced by nearly 60 per cent since a thinner band can be used. Still another advantage resulted since the thinner steel band leaves a greater radial space available for the balancing solder.

Fair Treatment for Employees Averts Manpower Problems

By B. C. Reber

IN THE SALESROOM of the Deason Radio Company, of San Antonio, Texas, there is a sign placed so that all may see. It reads:

"Please be kind to our employees. They are harder to get than customers."

This, better than anything else, explains why this firm is doing one of the largest volumes of radio service business in the city. But of greater importance, it explains why, at this time when the majority of firms are looking for help, Carl Deason still has his full staff of experienced radio mechanics—men who have been with him eight years. And it explains why, to help out, two young men put in part of their time in rendering radio service which the radio public of this territory has come to learn can be had at Deason's.

Discussing his policies in the employment and handling of help, Mr. Deason brought out some interesting points that other dealers may well consider at this time. He said:

"I think that one of the principle mistakes that is made in the hiring of service men is that too much attention is given to filling the vacancy and not enough to getting the right man for the job. When I am looking for a man, I look about for a man who has not only taken up radio as a profession, but likes it enough so that it is a hobby as well. Such a man naturally likes his work, will take more interest in what he does, will turn out better work, and will give you his best efforts.

"Second, I always pay the men who work for me the most that I can afford to pay them. I do not consider it good business to hire a man, expect him to turn out what we consider a highly-professional service, and then pay him what is the equivalent of laborer's wages. I know of several radio service men who have resigned their positions and accepted other lines of work in which they had little or no experience, but for which they were paid more money. Pay the man what the job is worth, and he will give you his best.

"In addition to the regular wage scale, I pay the men a dollar an hour for all overtime. Even though a man may be kept in for only five minutes after the regular closing time, he is paid for a full hour. Men appreciate this. They realize that I am doing everything possible to treat them fair, and their loyalty is reflected in their work.

"At Christmas time we split up a bonus. Last year this bonus amounted to $750, divided between three men according to the length of employment. This bonus system has been in effect for fifteen years, and always amounts to a nice little sum. This, too, is appreciated.

"Lastly, every three months, I give each of the men a war bond. This is a new reward that has been started during the past year, but the big value is that the men know that when we make a little extra money, they will not be forgotten.

"It is doing these things that show your appreciation to your men which in turn cause them to show their appreciation to you through steady, dependable work. And it brings out the best that is in them. You can go along confident that the work that is turned out is the

(Continued on page 62)

Carl Deason and his secretary in the sales room of the Deason Radio Company, San Antonio, Texas. Mr. Deason's common sense views on employer-employee relations has enabled him to keep a full staff of radio service experts despite manpower shortage.

Basic Tests for Electric Ranges

By R. A. Schau*

In repairing electric ranges, considerable time is required in locating the source of trouble. This article outlines a series of simple tests that can be made with no other tools than a test lamp. These should be especially helpful to men who have just taken up appliance service work.

THE MOST common electric range complaints are of a nature that a heating unit, (or units) is not operating or is not operating properly. This failure of operation is caused by a broken circuit or a frozen-closed circuit somewhere within the wiring, or within any of the electrical parts that go to make up an electric range. In order to determine the reason why a unit is not operating, it is necessary for a service man to understand how to test the various parts of an electric range.

All parts that complete the electrical range circuit to the unit are switches. The timer is a switch that makes and breaks the circuit at the time designated by the timer controls. A temperature control is a switch that makes and breaks the circuit controlled by the temperature in the oven. Therefore, each part of an electric range within the main electrical circuit, with the exception of the units, is tested in the same way as a common "off-and-on" switch.

Any tester can be used; for simplicity, we will use a test lamp (see Fig. 1-A) composed of a 230-volt lamp in a socket with two short insulated lead wires so that when the ends of the lead wires make contact between two points completing a circuit, the lamp will light. We will also use a split lamp (see Fig. 1-B); this is nothing more than an extension cord with one side severed so that when it is plugged in to an outlet and the two severed ends are placed together the circuit is completed and the lamp in the socket will light. If we place one side of this severed cord of the split lamp to a contact that is supposed to have a completed circuit through it, and the other side to the other contact, if the lamp lights it indicates the circuit is good. The electrical circuit is completed within the split testing set and it should not be used to test a part while current from another source is going through it as the results would be a direct short. In the following discussion, the terms "test lamp" and "split lamp" will be used to designate these two different test devices.

In an electric range, all parts of the electrical circuit are wired either in parallel or in series. This is best explained by a string of Christmas tree lamps. If these are connected in series when one lamp burns out the complete circuit is broken and none of the string will light; in parallel each lamp has a completed circuit and when one lamp burns out the others in the string will continue to light.

Within an electric range, the oven circuit is the most complicated; 115-volt oven circuits usually have the various parts hooked up in series; a 230-volt oven circuit can also be hooked up in series, or both hot wires of the circuit can be wired through the various parts making a parallel circuit.

Referring to Figs. 2 and 3, we will show the results that you will get in testing a series and also a parallel circuit. In the case of the series circuit, Fig 2, test between A and B on the temperature control. If the circuit is completed and current is flowing through the

*Mr. Schau is southeastern field service instructor for Edison General Electric Appliance Co., Inc.

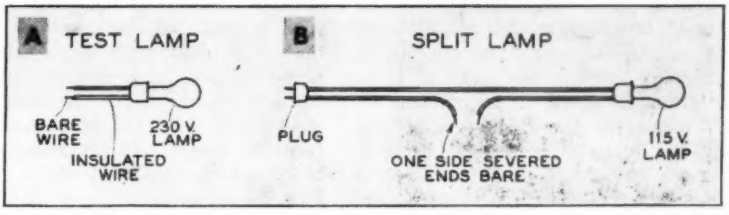
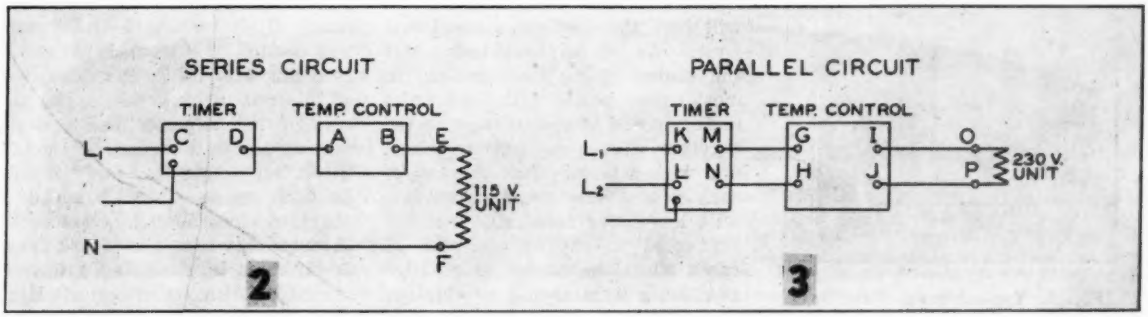


Fig. 1 (Above) There are two types of test lamps in general use: (A) The regular test lamp; and (B) the split lamp. In the accompanying article the regular test lamp is used except where the split lamp is specifically mentioned.

Figs. 2 and 3 (Below) These diagrams show two common methods of connecting timers, temperature controls, and heating elements in electric range circuits.



part, you will not get a light. However, if the only break in the circuit is in the temperature control, you will get a light. In other words if no light is obtained the part is probably OK. If one is obtained, something is wrong with the part and it will have to be repaired or replaced. This test holds good with any part of the range circuit that is wired in series. When there is only one resistance in a series circuit this resistance is actually in parallel. The unit is a resistance, so therefore, a test between points E and F would give a light whether the circuit within the unit is broken or not. (All tests described in this article are to be made with the regular "test lamp" except where the "split lamp" is definitely specified.)

From a hot wire to ground, a light will be obtained; therefore, to check if current is flowing as far as the temperature control, test between point A and some place on the range frame. A light will indicate current is going as far as the temperature control. Test between B and ground; if a light is obtained, a circuit is being completed through the temperature control. Any part which merely acts as a make and break switch and is wired in series in the range circuit can be tested in the same way.

In checking the temperature control in the parallel circuit, Fig. 3, if a light is obtained between G and H it indicates that circuit is complete as far as the temperature control. If a light is obtained between I and J, it means the current is flowing through the control. If no light is obtained between G and H, it means the circuit is not completed to the temperature control. Both of these wires are hot; therefore, a test should be made between G and ground and also H and ground. It is possible that the circuit on only one wire is out; in which case, it would be the one where we do not get a light, and the trouble can be found by following back on that circuit.

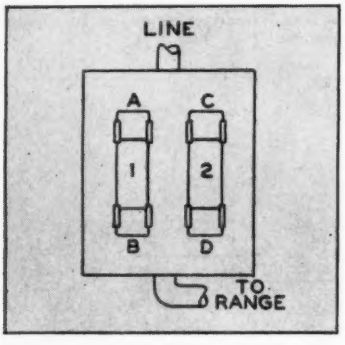


Fig. 4. Typical range fuse box.

When testing an electric range always check the easiest and most logical thing first. If all or a group of the units on the range will not heat the probability is that the fuses in the main switch box are blown.

To test these fuses put one lead of your test lamp on point A, Fig. 4, the other on point D, if a light is obtained fuse 2 is OK. If it fails to light, it indicates the fuse is blown. In checking fuse 1, test between contacts C and B. To test a cartridge fuse with a split lamp, pull it out of the fuse box and put one end of the severed wire of the tester to one end of the fuse and the other end to the opposite end of the fuse. If the fuse is good, a light will be obtained.

To make sure electricity is coming to the range, test the range receptacle, Fig. 5, if there is one. In checking with a test lamp, the following results should be obtained: 230 volts or full brightness of the 230-volt lamp between B and C; 115-volt or 1/4 brightness of the lamp between A and B; also, between A and C. To check if current is coming as far as the switches, test between the three bus wires leading to the switches. One of these bus wires is neutral; the other two are line leads. Between neutral and either line lead 115 volts is obtained; between the two line leads 230 volts is obtained. Some ranges have direct connections, others have connecting blocks. If the three wires leading into the range go to a connecting block rather than direct to the switches, this should be checked for loose connections. Somewhere within the above test, the trouble should be found if the complaint is that all of the units or a group of the units are not operating.

There are two main circuits in an electric range; the oven circuit and the surface unit circuit. We will test the surface unit circuit first. As stated previously, test the easiest thing first, which, in most cases, is the unit. All units are composed of two coils connected together with a common terminal, and with a terminal on the end of each coil. Therefore, each surface unit has three terminals that are connected to the switch. In all cases when the switch is on high position a light should be obtained

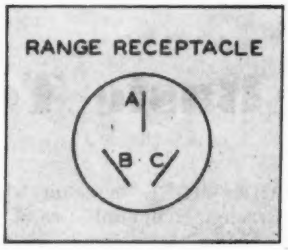


Fig. 5. Range Receptacle.

between the common terminal and either of the outside terminals. The voltage will be discussed later when we discuss the switch.

A break in an open coil unit can easily be detected; a closed type unit can be tested with a split lamp. Disconnect the leads at the unit terminals. When the two wires of the split lamp are placed on the two terminals (but not the common terminal of the unit), you will get a light to indicate that a completed circuit through the unit has been made. To test for a ground within the unit, place one wire on the unit surface, the other wire on one of the terminals. If you get a light, it indicates that there is a ground within the unit and that the unit is defective. The wires between the switch and the unit should be checked for breaks or loose connections. If a loose connection is not easily detected, turn the switch on and take the wires firmly in your hand pulling them slightly so that if there is a loose connection an arc will result at that spot.

In testing a surface switch, you should know the principals and actions of the various switches. Most ranges have two-, five- or seven-heat switches. The more common are the three- and the five-heat types. With the exception of some two-heat switches the number of heats can be determined by the number of positions of the switch. One position, of course, would be "off", the balance would indicate the number of heats. A three-heat surface switch takes a 115-volt unit, a five-heat switch takes a 230-volt unit. High heat on a three position switch is obtained by either directing 115-volt through each coil of the unit or by breaking the circuit of the common lead and didecting 230 volts through both coils in series, giving the same results in both cases. Second speed is obtained by directing 115 volts through only one coil. Third speed is obtained by directing 115 volts through both coils in series. High

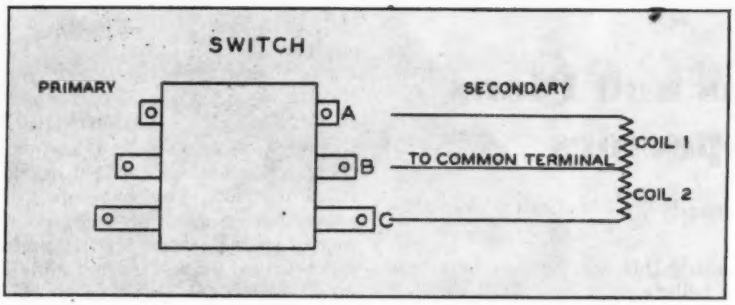


Fig. 6. This diagram shows the relation of range switch terminals to the terminals of the heating elements.

heat with a five-heat switch is obtained by directing 230 volts through each coil. In other words, the coils are in parallel on 230 volts. On second test, only one coil is used on 230 volts; third speed puts both coils in series on 230 volts; fourth speed uses one coil on 115 volts; and fifth speed uses both coils in series on 115 volts. A surface switch has three terminals that are connected to leads going to the unit, and has either two or three terminals that are connected to the line leads coming into the range.

We will refer to the terminals that are connected to the unit as the secondary side of the switch, and the terminals that are connected to the line lead coming into the range as the primary side of the switch. On the primary side, if there are two wires, one will be neutral so, therefore, a test lamp between the two wires will show 115 volts; if there are three wires, 115 volts will show between neutral and either of the other two wires, 230 volts will show between the two hot wires. If the primary side of the switch checks out this way, it indicates that current is coming as far as the switch. In testing the secondary side of the switch, if it is not operating properly, it usually will show up on high position. However, in some cases it will be necessary to check all positions. In checking high speed, it is not necessary to disconnect the leads connected to the unit, but in checking the other speeds it is best to do this so that it will be accurate.

Referring to Fig. 6, we will assume that terminal B is the one that is connected to the common terminal of the unit. Therefore, with a test lamp on high speed with a three-heat switch we would get 115 volts between A and B and also B and C. On a five-heat switch, we would get 230 volts on the same test. We have previously explained how the various heats are obtained. If it is necessary to check all positions of the switch, you can determine what reactions should be had in testing by the information given

(Continued on page 61)

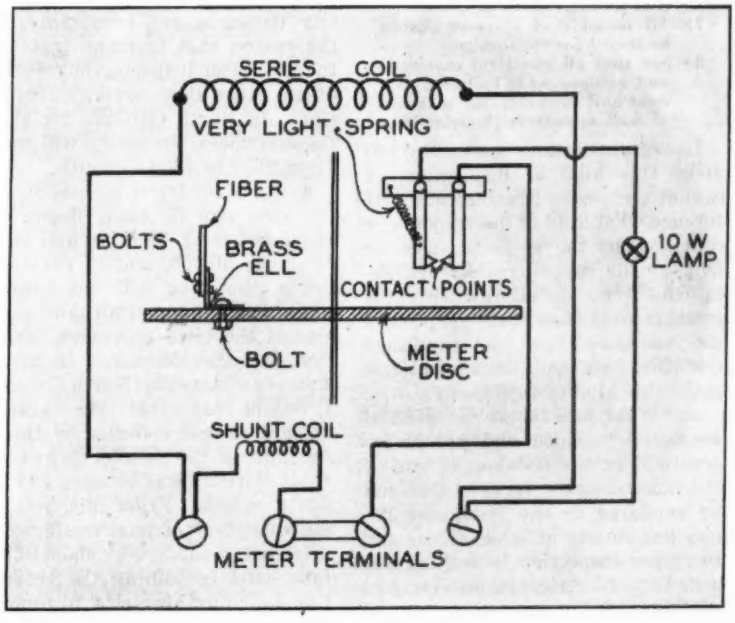
"Off and On" Indicator For Appliance Service

FROM ROY S. PARSON, superintendent of service, for Central Power and Light Company, at McAllen, Texas, comes the following suggestion for converting an old watthour meter into a relay for indicating automatic appliance cut-on and cut-off. The accompanying diagram shows how the old 5-ampere, 120-volt, 2-wire meter was reconnected.

The register and magnets were removed, and contacts from an old demand meter were installed in such a position that they would be closed when the disc turned. A small piece of brass in an L shape, bolted to the disc, had a small piece of sheet fiber attached to it so that it would strike the contacts as the disc turned. A small spring is attached to one of the contacts so as to open them when the meter is not energized.

Appliance service men frequently encounter automatic appliances upon which there is no indication as to when the current cuts on and off, as for example automatic irons. By connecting this relay into the circuit ahead of such an appliance, the small pilot lamp turns on and off whenever the automatic appliance cuts on or cuts off.

Such a relay can be mounted permanently directly over the service workbench. A regular 120-volt supply line should be brought to the two left-hand terminals of the meter, and the two right-hand terminals should be connected to the appliance under test.



This diagram shows how an old 5-ampere, 120-volt watthour meter was converted into a relay for indicating to the service man the cut-on and cut-off of automatic appliances such as automatic irons, etc. Register and magnets were removed; a set of contacts installed; and a "stop" on the register arranged to close contacts when circuit through meter is carrying current and torque is exerted on disk.

Postwar Problems and Plans For Electrical Inspectors

By N. E. Cannady*

I WOULD like to call to your attention a few of the main items that confront the electrical inspector and inspection department at this time and that must be met and answered before any real postwar planning can be done:

1. What constitutes a good inspection? This may vary in the minds of individuals, but the results in all instances are the same. I shall enumerate some of the essential things that I believe should go into a proper inspection:

(1) See that circuits are not overloaded.
(2) See that proper size switches and fuses are used.
(3) See that anything that should be polarized, is polarized.
(4) Every conductor, switch and light fixture should be tested for grounds and short circuits.
(5) See that all materials are standard and used for the purpose they were intended.
(6) The system should be properly grounded. (The average driven ground is the greatest farce ever perpetuated on the innocent public.)
(7) All metal clad systems should be tested for continuity.
(8) See that all electrical materials and equipment is installed in a neat and workmanlike manner, as well as correct electrically.

Instruments are necessary to make this kind of inspection. I cannot see where it makes any difference what kind of instruments or contraptions the inspector uses so long as the proper results are obtained. Who should furnish these instruments? How many inspectors do you know have the necessary qualifications and instruments to make this kind of inspection?

2. What does the public think of inspection? Good and proper inspection, in my opinion, is one of the most valuable services that can be rendered to the public by the city and county officials. Poor and improper inspection is nothing but a racket. Electrical inspection is no different from any other service that is being bought. Those purchasing this service have been lead to believe that it was absolutely necessary and essential, and yet when the simplest questions are asked the inspector, in many instances he is unable to give any answer, and immediately the property owner realizes that he is paying for a service, but is getting nothing but a certificate.

3. What does the electrical industry think of it? The electrical industry knows that in many instances inspection is nothing but a farce and another means of taxing the public for a service that is not rendered.

4. What are the qualifications necessary for an electrical inspector? (1) He should be honest and unbiased in his opinion. (2) He should have at least the electrical experience of a good journeyman. (3) He should have the courage to enforce the Code and special rules.

5. Can electrical inspection pay its own way in cities? It is rather hard to determine just what size city would be self-supporting, for the reason that in many instances the electrical inspector has several duties other than electrical inspection. In North Carolina for all of these services, the salary will range from $150 to $300 a month.

6. Can electrical inspection pay its own way in small towns and rural districts? In cities and towns of under 50,000, and in rural districts, the fees will not average more than $150 monthly, and as the size of the town decreases, inspection fees also decrease. In normal times in a state like North Carolina, I would say that the average amount of fees collected by the inspectors in the smaller towns and rural districts was between $25 and $50 a month. From this, you can see what type of man would accept this kind of job. Why should he be interested in joining the International, or anything else, to improve himself in order to make this salary? It is evident that the town and county officials, who employ these inspectors, do not consider it of enough importance to pay a living wage for this service. And the "$64 question" is, who is going to pay for it?

7. Should there be any difference in the quality of inspection in cities than in towns and rural districts for the same class of installation? Emphatically no! In the rural districts, you have no fire protection in case of fire; or in case of an accident, it is often many miles to the nearest doctor or hospital facilities. The average electrical contractor doing rural wiring is not as well informed as those in the cities and towns. In rural sections, in case of outage, it is often impossible to get relief until the next day.

8. Should the electrical inspector restrict his activities to inspecting for fire and accident only, or to what extent, if any, should the service that the installation will give be considered? In my opinion, the inspector owes all the service that could be of any benefit to the property owner, for the reason that the property owner is employing him and paying him for service which should not be restricted.

9. Should the inspector be competent to advise the property owner as to his needs, whether he does or not? He should be competent to discuss the advantages and conveniences that could be had from a proper adequately wired installation. In this way, the property owner would feel that he was getting value received for the inspection fees being paid.

We might as well face the issue, regardless of how complicated or how unpleasant, as to whether or not inspection is important and necessary. If it is, we have certainly failed as an organization and an industry to educate the public to this fact, as our actions would indicate that we of the electrical industry do not place any great amount of importance on this service.

Of all the inspectors' meetings that I have ever attended, I cannot recall a single instance where these problems have been given first prominence. From this, it is evident that very little consideration is being given to the small town and rural inspector—and I believe it would be a safe estimate to say that at least 90% of the inspectors in the nation are from cities and towns of under 50,000 population. We have either got to place more importance on the type and charactor of the inspectors and inspec-

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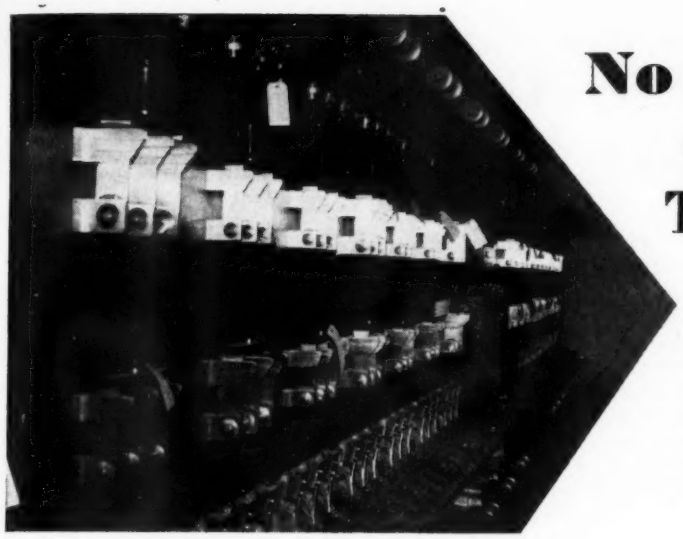
*Mr. Cannady, who is electrical engineer for the North Carolina Insurance Department, presented this discussion at the annual meeting of the Virginia Chapter, International Assn. of Electrical Inspectors, in Richmond, Nov. 9 and 10, 1943.



No Job Too Large Or Small—for This Contractor

By Richard Lane

Wartime censorship prevents reproduction of photographs of the large electrical installations recently completed by the Slater Electric Co., of Memphis. Shown here, however, is the switchboard in the Memphis Sears, Roebuck & Company building—a Slater installation representing one of the largest electrical contracts in the Memphis area.

THERE'S NO denying the effect of war upon industry in general and the electrical business in particular. It's pinching and it's hurting. But the men who are going to see it through and then ride the tide of postwar prosperity are those like William Slater, electrical construction engineer, of Memphis, Tenn.

Perhaps it's because Slater is Memphis' oldest electrical contractor in point of service, one who knows how to take the lean years as well as the lush ones. Perhaps it's because Slater is an "old hand" at meeting wartime conditions—this is his third war, although admittedly his toughest. Perhaps it's because Slater's energy and reputation for service form an unbeatable combination. Many, including his competitors, will tell you so.

But what lesson is there for other electrical contractors?

There's an important story behind the success of the Slater Electric Company—something that other Southern electrical contractors can well afford to consider in these days of priorities, labor shortages, mounting costs, and uncertainties.

"No job is too big or too small" for the Slater company. The company stands back of its slogan, too, by handling everything from industrial and Army contracts that run into the hundreds of thousands of dollars, to the repairing of appliances involving mere dollars and cents.

While many electrical contractors the country over are lamenting the shortages of vital materials, the Slater company through its own initiative and farsightedness is handling a steady volume of business and doing quite well, too. But the backbone of the Slater business now comes from satisfied customers, stretching back for almost half a century. It is business that stands as a testimonial to the company's customer service down through the years. It is business that is all the more appreciated because it is dependable business and for the most part it is unsolicited.

"Ninety per cent of our business is received from repeating clients, including some having large jobs and approved priorities, and then, of course, there are those needing appliance and motor repairs," Slater explains. "We have found that friends we have stuck by and helped in other years, on jobs big or small, are now sticking by us and giving us their business.

Repair Volume Increasing

"Our advertising is an important medium in reaching new customers, and we are continuing our policy along this line. We find that more and more persons are searching for electrical repair shops, bringing their appliances and motors with them. This part of our business, which in the past had been more or less a sideline with us, is now taking up the slack between contract jobs and, incidentally, proving profitable.

"We believe that most of the government wartime construction in this section of the mid-South is now over. Smaller jobs are going to become increasingly important for all of us.

"So far, we have been able to satisfy most of our customers on appliance work, except parts for some motors. We are continuing to repair common appliances such as fans and irons and also are rewinding small motors. We still sell a few new appliances, although of course nothing like normally. Our upstairs repair shop is equipped to handle motors of any size and we have eight electricians there to see that the work is done expertly. We've handled a lot of work that other electrical contractors simply couldn't do.

"In fact, we now have more merchandise and materials on hand than ever before for general work. This is enabling us to do a good deal of maintenance and industrial work in Memphis, too."

With private construction frozen, Slater is finding little residential work, except for war housing. Memphis recently was allotted 200 new war housing units. The Slater company is going after work of this type, along with the repairing of old wiring.

Another important side of the Slater business is the repairing of motors for cotton gins and oil mills in the mid-South. Over the years, the company has sold equipment to many such concerns.

Allotment of new wire based on the company's business in 1941 was easier on Slater than many

(*Continued on page 60*)

Proper Care in Cable Splicing Reduces Cable Maintenance *

PROPER REPAIR of a cable after failure is very important, and unless it is done properly, another failure will occur in the same spot. Splicing ordinary, 600-volt, rubber-insulated wire is not a difficult task. However, the splicing of cables for higher voltages and cables of special construction, such as armored cables or portable cables, requires special technique. Since it is important that the splices be made properly, the maintenance man should obtain from the cable manufacturer his instructions for splicing the particular type or types of cable installed in the plant. If this is done and all instructions are kept on file for quick reference, a splice can be made correctly when the emergency arises.

The use of molding equipment for splicing rubber-packeted portable cables is recommended for best results. A mold, properly used, will make a splice almost equal to the original cable.

Testing of cables in the field is often done with a megohmmeter, but this method does not always reveal weak spots which result in cable failure. The results may be inconsistent because of the presence of moisture, and the cable may not make intimate contact with the conduit throughout the run.

If a megohmmeter is to be used to test insulation resistance, a guard ring should also be used to prevent incorrect results due to leakage over cable surface.

If the cable is operating on an ungrounded system, it is possible that a high-resistance ground fault may develop and not become apparent to the operator. On this type of system, a ground detector should be applied to check for grounds.

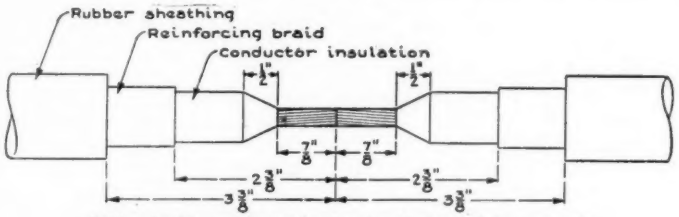
Keep a reel of portable or semi-portable cable on hand to bridge cable failure while repairs are being made. This will maintain at least a partial flow of power and help cut down a production delay.

An emergency portable cable can be made up from salvaged lengths of cable, and stored in a suitable place. In some instances, it may be necessary to run two cables in parallel in order to carry the same power as the damaged cable.

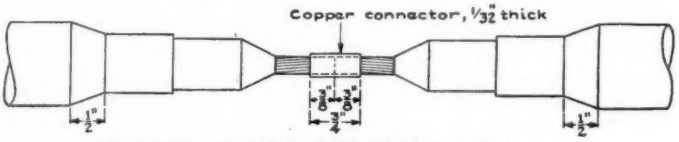
Cable should be stored on reels or in coils in a cool, dry place. Lagging should not be removed from a reel before necessary. If it is necessary to store the cable outdoors, provide protection from the weather. Ends should be kept sealed to keep out moisture. Whenever cable is removed from a reel, the amount removed should be marked on the reel, so as to provide a record of the amount remaining.

*This information is based on data prepared by General Electric Company engineers.

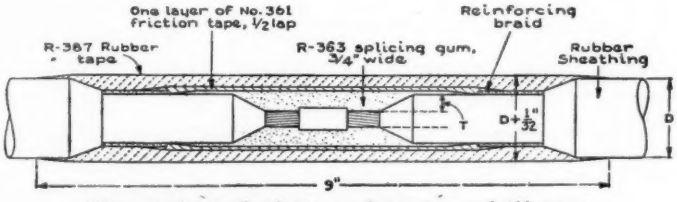
HOW TO SPLICE PORTABLE CABLE



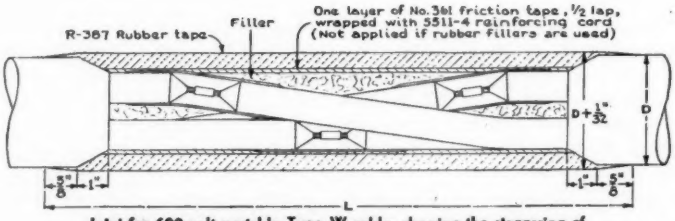
Rubber sheathing, reinforcing braid, and conductor insulation removed, and conductor insulation penciled.



Copper connector assembled and rubber sheathing penciled.



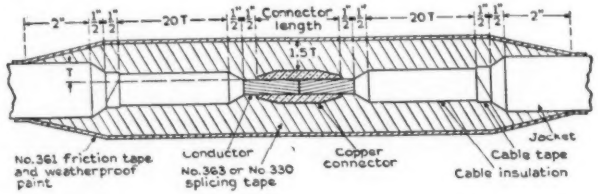
Splice completed with splicing gum, friction tape, and rubber tape applied. The joint should now be vulcanized.



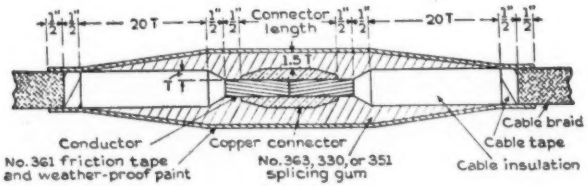
Joint for 600-volt portable Type W cable, showing the staggering of individual splices.

HOW TO SPLICE POWER CABLE

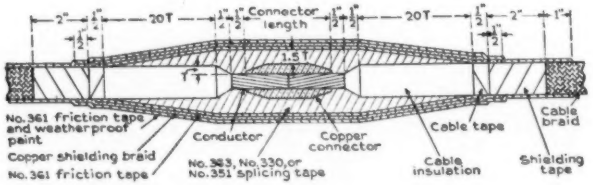
Rubber-jacketed Single-conductor, Nonshielded



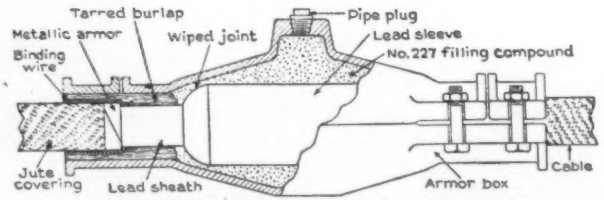
Single-conductor, Braided, Rubber-insulated, Nonshielded



Braided, Single-conductor, Shielded, Rubber-insulated



Parkway Cable

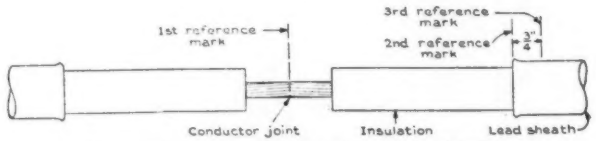


A method of installing an armor box over a lead-sleeve joint on leaded JFJ armored parkway cable.

HOW TO SPLICE LEADED CABLE

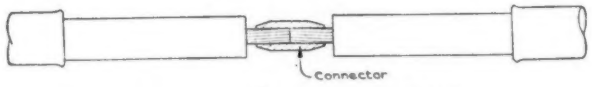
Single-conductor, Nonshielded, up to 5 Kv

1.



Cables brought together, lead sheath removed, and enough insulation removed to permit assembling the connector.

2.

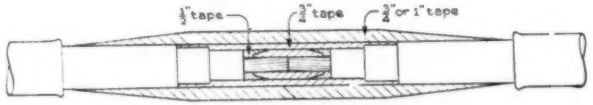


Connector assembled centrally over conductor joint.

3.

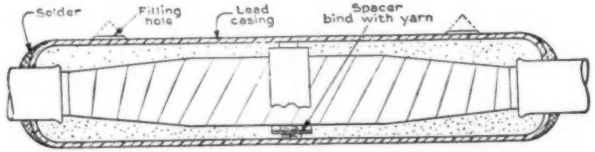
Cable insulation stepped and bound.

4.

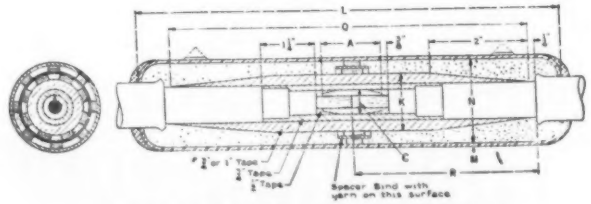


Reinforcement tape applied.

5.



Joint completed, with spacer and casing in place, and filled with compound.



Completed joint showing thicknesses and other dimensions. Get manufacturer's recommendations for dimensions of the above and following joints, as these will vary depending upon cable size and voltage.

Basic Operating Principles Of Electrical Instruments

By G. F. Gardner*

Part 4.—Magnetic Vane Instruments

ONE type of instrument construction often used for alternating-current ammeters, and to a considerable extent for voltmeters, is the magnetic-vane attraction type. This probably is adaptable to the greatest number of modifications of any of the instrument types. A few of the common ones will be described here. One of the simple ways to make a magnetic-vane attraction instrument is to arrange a construction as shown in Fig. 29.

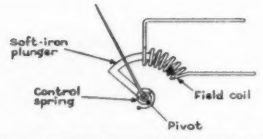


Fig. 29. Schematic diagram of simple magnetic-vane attraction-type instrument

When current is sent through the solenoid, the plunger is drawn into the coil, and a measurable deflection of the instrument pointer is obtained. As a matter of fact, such arrangements are used for the less-expensive class of instruments. The scale, however, leaves much to be desired from the standpoint of uniformity, the power consumption is high and such an instrument is likely to be very sensitive to slight zero shifts. The worst objection, however, applies to length of scale, which is short.

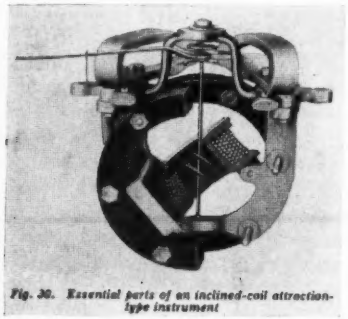


Fig. 30. Essential parts of an inclined-coil attraction-type instrument

One rather ingenious method of obtaining a reasonably long scale is to use a construction such as shown in Fig. 30. Incidentally, this construction overcomes many of the other shortcomings, and is used in high-grade instruments. If the reader will study this carefully, he will note that both the coil and moving vane are inclined at an angle to each other, and that, theoretically, the instrument pointer could have a movement of almost 180 degrees. See Fig. 31.

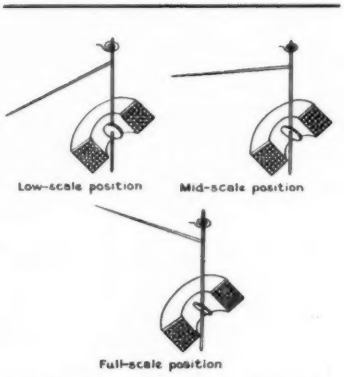


Fig. 31. Inclined-coil attraction-type instrument

Another very important class of magnetic-vane type of instrument is the magnetic-vane repulsion type. A schematic view of this type of construction is shown in Fig. 32. In operation, suppose a direct current is sent through the field coil; the magnetic vane embedded in the side of the coil will have definite poles, N-S, induced in it at the points shown. The moving vane will also be magnetized by induction, the polarities being N-S, as shown. It will be noted that the north pole of the moving vane is nearest to the north pole on the piece of magnetic material embedded in the coil, and the south poles are similarly placed. Hence, the vane tends to move away or to be repelled from the stationary magnetic piece. If alternating current is applied to the instrument, the two vanes will simultaneously change polarities as the current varies throughout the cycle; thus, the instrument also operates on alternating current. In fact, it is in alternating-current measurements that the instrument finds its greatest application.

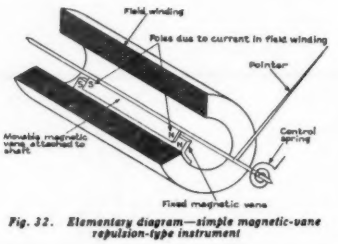


Fig. 32. Elementary diagram—simple magnetic-vane repulsion-type instrument

Damping Repulsion Instruments

To obtain damping on magnetic-vane repulsion instruments, it is nearly always necessary to resort to air damping, since the instrument is appreciably affected by any stray field from the permanent magnet used in connection with magnetic-type damping. The magnetic-vane attraction instrument, previously described, generally employs magnetic damping.

The older type of magnetic-vane instruments was equipped with an especially selected grade of soft iron for the vane. But, when these instruments were used on direct current, variable errors resulted because of a magnetic condition known as hysteresis in the vane. A special nickel-iron alloy, known as Permalloy, which is almost entirely free from this condition, is used in the vanes of modern-type magnetic-vane instruments. For this reason, the modern type of magnetic-vane instrument can be used with very good accuracy on direct current, provided that the average of direct and reverse readings is taken.

In the construction of magnetic-vane instruments, it is general practice to send the entire current through the field coil. The energy consumption varies considerably with the rating of the instrument being used. And while the resistance of most magnetic-vane ammeters may not seriously alter the conditions of an alternating-current circuit, it may cause appreciable disturbance of circuit conditions when instruments of low-current rating are used. For example, a magnetic-vane instru-

*Mr. Gardner is associated with General Engineering Laboratory, General Electric Co., Schenectady, N. Y.

ment of the inclined-coil attraction type rated 5 amperes, has a resistance of 0.061 ohm and an inductance of 90 microhenries. At 60 cycles, the reactance of the instrument amounts to 0.034 ohm, resulting in an impedance of 0.07 ohm. For most applications, the addition of this impedance to a circuit will not seriously affect the indications. However, consider an instrument of the same type rated 0.5 ampere full scale.

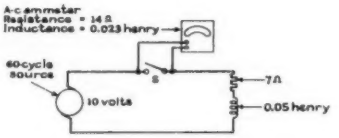


Fig. 33. Measuring circuit in which impedance of alternating-current ammeter is major consideration

A typical instrument has a resistance of 14 ohms and an inductance of 0.023 henry. At 60 cycles, the reactance will be 8.67 ohms, and the instrument impedance will be 16.47 ohms. When this instrument is connected in a circuit, shown in Fig. 33, and rated current is sent through it, the drop across the instrument will be large. It will be seen that the normal current which should flow in this circuit is $E/(R+jX)$ or $10/(7+j18.85)$ or 0.497 ampere; but when we add our instrument, we change the circuit constants to $10/(21+j27.52)$, and the ammeter actually reads 0.289 ampere, resulting in a discrepancy of 0.208 ampere or about 40 per cent.

Induction Type Instruments

The fourth class of instruments which we are considering briefly is the induction type. This type is not used as widely as are the types previously mentioned. If we take a disk of copper or aluminum and place it in a field structure, as shown in Fig. 34, a current will be induced in the disk. The disk will tend to rotate when alternating currents of the proper phase relation are applied to the two coils. If we so place a spring that it resists the motion in the disk, and if we place a pointer to indicate the resultant position, the value of current will be indicated in the alternating-current line. This instrument, of course, can be used on alternating current only. If direct current were applied, the only time at which voltage would be induced in the

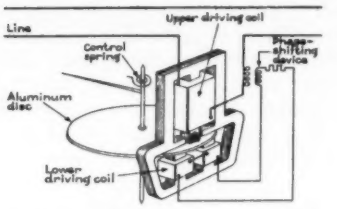


Fig. 34. Elementary diagram—simple induction-type instrument

disk would be just when the circuit was opened or closed. Thus, the disk will tend to move forward and then drop back to its initial position when a steady-state condition is reached. The disk must be made of aluminum, or copper, or of some other material of high electrical conductivity. Since all these materials possess appreciable temperature coefficients of resistance, changes in temperature will affect the readings materially, unless carefully compensated for in other parts of the circuit. This has limited the usefulness of these devices as instruments to a considerable extent.

On the other hand, let us take a structure as shown in Fig. 34, omit the spring and pointer and place magnets as shown in Fig. 35 at the edge of the disk. When alternating current flows in the field structure, the disk will tend to rotate as before. The disk will cut lines of magnetic flux from the magnets located at its periphery, and the currents induced will tend to reduce the speed of the disk. The effect of temperature on such an arrangement is not nearly so pronounced as in the case of the spring-controlled induction instrument. As the temperature increases, both the induced current actuating the disk and the eddy currents caused by the damping magnets tend to decrease in the same proportion. If we change the connections and

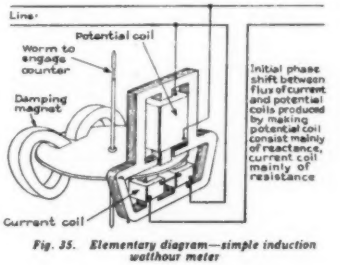

Line
Potential coil
Worm to engage counter
Damping magnet
Initial phase shift between flux of current and potential coils produced by making potential coil consist mainly of reactance, current coil mainly of resistance
Current coil

Fig. 35. Elementary diagram—simple induction watthour meter

add a counter, connected by suitable gearing, to count the total revolutions of the disk of the device shown in Fig. 35, we have the basic elements of the induction watthour meter.

Special Tests Made On ZMA Treated Poles

By H. H. Schomburg

Supt. of Light and Power Dept. City of Albany, Ga.

EXPERIENCE with ZMA (zinc meta arsenite) treated poles in the electrical distribution system of the city of Albany, Georgia, indicates that special attention should be given such poles. We put a breaking point test on some of our ZMA treated poles with results worse than we expected. These poles have been in service since 1929 to 1933, so they are from 10 to 14 years old.

We had one 35-foot ZMA pole with three 7½-kva transformers to break off at the ground line on a clear day without wind. Examination of this pole showed it was in excellent shape above ground and below ground except for a narrow band about four to six inches at the ground line, and even in this area it was firm and hard.

A tester with knife or screwdriver would have passed it by as OK. Before we could do anything about it, two more ZMA treated poles with transformers failed during a wind storm.

We started replacing ZMA poles with transformers wherever they did not have wires in four directions. Some of the poles look so good, it was difficult to condemn them, especially with the incentive now to conserve everything to help in the war effort. We put a break test on three representative poles that we had stripped. The results were as follows, all poles breaking off clear at ground line:

1st broke at 250 lbs. pull,
2nd broke at 120 lbs. pull,
3rd broke at 50 lbs. pull.

These were Class 5, 35-foot poles, six feet in the ground with a 120-foot piece of guy wire attached one foot from top of pole. We used a cable tension type dynamometer such as is used by the Bell Telephone Company, getting gradual pull with a Coffin hoist. The first pole which broke at 250 lbs. looked good at the

ground line and seemed firm with test by knife blade. We thought it was still a pretty good pole. In the case of the second pole, the knife test showed it soft to a depth of approximately 1½ inches at the ground line. In the third pole, one could stick a screwdriver two or three inches into the pole.

We tested another 40-foot pole, cutting off the bottom so that we had the equivalent of a 35-foot pole. This broke at 2100 lbs. at about seven feet above ground line, splintering like a new pole.

The most dangerous feature of this ZMA treated pole is that it looks good when there is little or no strength left. This test was an excellent safety first demonstration for our line crew, for our linemen now know definitely that such a pole should be piked when climbed unless the overhead wires will hold it up if it breaks.

Delay-Control Motor Tested For Possible Overheating

By J. O. Kimrey*

ONE OF THE BASIC principles incorporated in the design of step-type regulator controls is that of providing a time delay device to prevent unnecessary operations of the mechanism due to momentary line voltage fluctuations.

On the 3,000 kva, 6900 volt regulator under consideration, this time delay is provided by an oil-emersed motor and gear mechanism enclosed in an oil-tight case. This motor is of the reversible type and has a field winding rated at 230 volts, and is energized from a source of supply from within the regulator. This winding is energized at all times. The starting and direction of rotation of the motor is controlled by a shading coil, one for clockwise rotation, the other for counter-clockwise rotation. These coils are energized through the contacts on the balance beam of the contact-making voltmeter. This arrangement prevents both shading coils being energized at the same time. The heat generated by the field winding of the control motor is transferred through oil to the case and is dissipated into the atmosphere.

A recent inspection of this regulator revealed that the case of the delay control motor was rather hot. The question of whether or not this was a dangerous heat seemed important. A preliminary test indicated that approximately 250 volts were being applied to the field winding of the motor. This seemed like a possible reason for a high temperature except for the fact that the motor seemed hotter some times than at others. Since there were several factors that might contribute to such a heating condition, it was necessary to chart these factors to properly evaluate the effect of each on the temperature of the delay control motor. Simultaneously tests were run to determine:

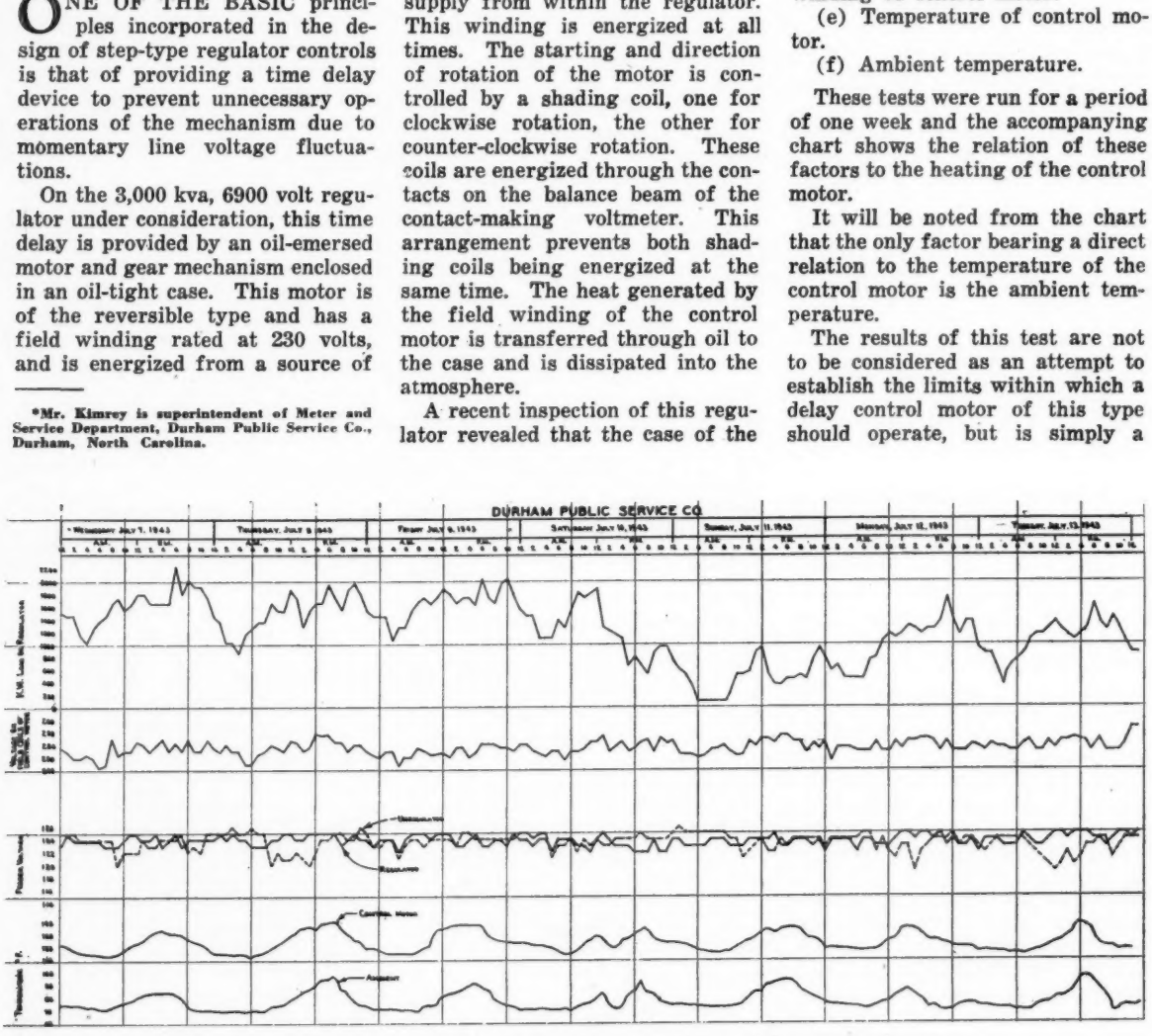
(a) Load on regulator.
(b) Unregulated voltage
(c) Regulated voltage
(d) Voltage applied to field winding of control motor.
(e) Temperature of control motor.
(f) Ambient temperature.

These tests were run for a period of one week and the accompanying chart shows the relation of these factors to the heating of the control motor.

It will be noted from the chart that the only factor bearing a direct relation to the temperature of the control motor is the ambient temperature.

The results of this test are not to be considered as an attempt to establish the limits within which a delay control motor of this type should operate, but is simply a

*Mr. Kimrey is superintendent of Meter and Service Department, Durham Public Service Co., Durham, North Carolina.



Plotted results of tests made on step-type regulator delay control motor.

means of presenting field data to the manufacturers who should say whether or not the conditions existing are satisfactory for the operation of his equipment.

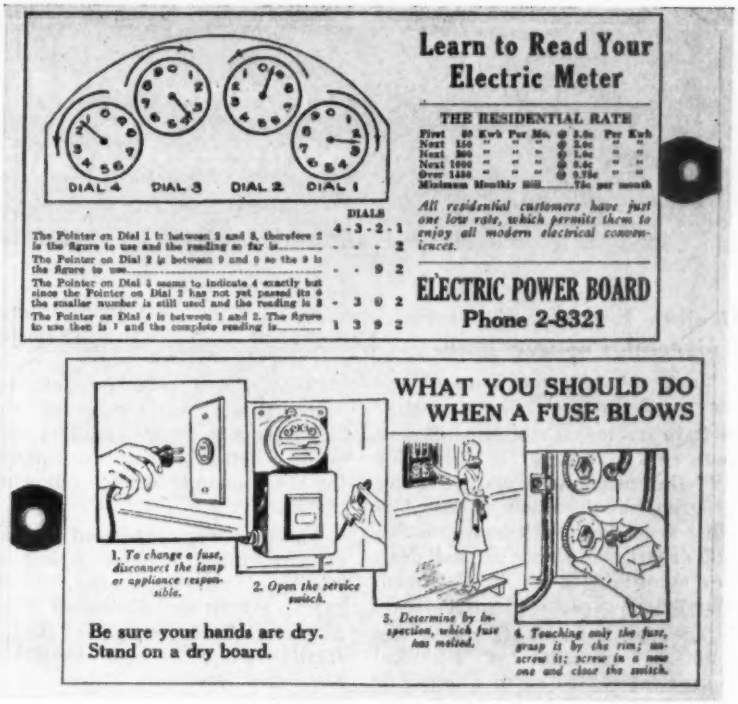
Electronic Insulation Resistance Tester

A NEW ELECTRONIC insulation-resistance meter for measuring the resistance of insulation in apparatus during the manufacturing process, thus revealing imperfections before the product leaves the factory, has been announced by the Special Products Division of the General Electric Company. The instrument is also desirable for checking the condition of insulation of apparatus in service, and for use in the laboratory for rapidly testing a wide range of production or experimental samples of insulating material.

The instrument consists of a conventional electronic rectifier, Thyrite bridge circuit, and an electronic-tube voltmeter. It is available in two types. One type has a scale calibrated from 1 to 50 megohms and measures resistance at 500 volts d-c; the other type has a 0 to 20,000 megohm total range and measures resistance over four different resistance intervals—from 0-5 megohms at 0-250 volts d-c and 5-200, 50-2000 and 500-20,000 megahms at 500 volts d-c. Any range may be quickly selected by a panel-mounted rotary switch.

In the operation of the insulation-resistance meter, which can be used wherever 115-volt, 60-cycle current is available, the measuring leads from the instrument are connected to the apparatus or material to be tested. The scale-range selector switch is turned to the lowest range, and the power switch is turned on. If necessary, the selector switch is turned to successively higher ranges until the pointer of the illuminated scale is in the center portion of the scale. The resistance of the material under test is read directly in megohms. The test voltage is regulated to 500 volts d-c by the Thyrite bridge, even though the 60-cycle line voltage is fluctuating.

The new electronic insulation resistance testing meter.


Learn to Read Your Electric Meter
THE RESIDENTIAL RATE
First 10 Kwh Per Mo. @ 3.0c Per Kwh
Next 150 " " " @ 2.0c " "
Next 300 " " " @ 1.0c " "
Next 1000 " " " @ 0.6c " "
Over 1460 " " " @ 0.75c " "
Minimum Monthly Bill ——The per month
All residential customers have just one low rate, which permits them to enjoy all modern electrical conveniences.
ELECTRIC POWER BOARD
Phone 2-8321
DIAL 4
DIAL 3
DIAL 2
DIAL 1
DIALS
4-3-2-1
The Pointer on Dial 1 is between 2 and 3, therefore 2 is the figure to use and the reading so far is 2
The Pointer on Dial 2 is between 9 and 0 so the 9 is the figure to use 9 2
The Pointer on Dial 3 seems to indicate 4 exactly but since the Pointer on Dial 2 has not yet passed its 0 the smaller number is still used and the reading is 3 3 9 2
The Pointer on Dial 4 is between 1 and 2. The figure to use then is 1 and the complete reading is 1 3 9 2
WHAT YOU SHOULD DO WHEN A FUSE BLOWS
1. To change a fuse, disconnect the lamp or appliance responsible.
2. Open the service switch.
3. Determine by inspection, which fuse has melted.
4. Touching only the fuse, grasp it by the rim; unscrew it; screw in a new one and close the switch.
Be sure your hands are dry. Stand on a dry board.

This tag, showing what to do when a fuse blows, is being placed on every meter in Chattanooga by the Electric Power Board serving that city. Both sides of the tag are shown here.

Meter Tags Reduce Fuse Change Calls

AS GASOLINE, tires, and manpower become more restricted, all departments of the Electric Power Board of Chattanooga are working together to reduce the number of unnecessary trouble trips. While there is no intention of being less helpful to customers, the Power Board is telling customers how they can help conserve valuable materials and time by learning the simple operation of replacing blown fuses.

Early in 1942, a program was started to educate customers in this occasional household job. It is vital that everyone keep his electrical wiring system in good shape and an important item of this program is that the right size fuse be in the proper place as a safety valve. Many accidents which might have caused fires, only result in blown fuses.

Over 4400 bulletins of instruction have been distributed to interested customers since the educational work began. The trouble clerk discusses "fuse out" or lights out" calls with the customer to determine the cause of the trouble and many times enables the customer to restore his own service immediately.

When the trouble man makes a call where a fuse has blown, he shows the customer how to replace fuses and leaves several extra ones. In addition, monthly bills have carried the simple picture story of fuse replacement. Thus every customer has had an opportunity to study the subject. Also many women were given instructions in the 4-Star Homemaker classes conducted recently.

This same story is told on the

(Continued on page 59)

NEWS of the INDUSTRY
National and Southern

Dealers Enthusiastic Over Universal Postwar Plan

With over 15,000 requests for "U" Plan books pouring into New Britain from all sections of the country Universal's "U" Plan for "V" Day dealer post war planning program has the whole country sizzling from large utility companies and department stores to small dealers according to W. J. Cashman, Universal's director of promotion.

The plan is being offered to any qualified merchant of electrical equipment regardless of whether or not he was a Universal dealer before the war. In emphasizing this point, Mr. Cashman said.

"It is in the industry's interest to have all dealers better prepared to face the future. 'A bird in hand is worth two in the bush' and we believe the "U" Plan for "V" Day will flush prospects for post war appliances from cover, changing a potential industry demand to specific demands on dealers' books throughout the nation, thus enabling dealers to plan better for the post war period through information secured from their customers. In addition, it provides a method for a more orderly flow of merchandise through dealer stores following the war.

"We believe that through national dealer application of the "U" Plan the entire industry will be in a better position to compete for the consumer dollars following the war."

The plan was announced to dealers in October through spreads in *Electrical Merchandising*, ELECTRICAL SOUTH *and Electrical West*, *Electrical Home Equipment Dealer*, *Hardware Age*, *Retailer and World*, *Southern Hardware*, *House Furnishing Review*, *Retailing Home Furnishings* and other trade papers.

According to Universal executives dealers of all types from coast to coast have been sending in a constant flow of requests for more information, plan books and sets of promotional material for point of sale identification, showing a surprising interest in the "U" Plan for "V" Day.

Tradewise the dealers indicating the most forward interest are the so-called electrical specialty dealers with hardware and furniture dealers close to the top of the list. Surprising interest was shown by department stores in the plan and many utilities and electrical associations requested further information on the application of the plan to their areas.

Universal executives discuss "U" Plan for "V" Day post-war program: B. C. Neece, vice-president and general sales manager of Landers, Frary & Clark is shown discussing the now nationally known "U" Plan for "V" Day . . . Universal's postwar planning program with E. J. Van Buskirk, vice-president, left, and W. J. Cashman, director of promotion, at right.

Better Light Bureau Prepares for Postwar

Plans are getting under way for an expanded post-war program of public education on the relationship of Light and Sight, it is announced by H. P. J. Steinmetz, chairman of the National Better Light Better Sight Bureau.

H. P. Steinmetz

Two important committees — a Home Lighting Planning Committee and a Commercial and Industrial Lighting Committee — are being appointed to prepare plans, programs and materials for availability to the lighting industry.

The Home Lighting Planning Committee, already functioning, consists of a personnel with broad experience and judgment selected from the various interests most concerned with "Light for Seeing" development. Its membership includes Harry Restofski, West Penn Power Co., chairman; J. M. Stedman, Pennsylvania Power & Light Co.; H. A. Stroud, Monon-

gahela West Penn Power Co.; Henry G. Clum, Jersey Central Power & Light Co.; Mariquita Dygert, Detroit Edison Co.; Myrtle Fahsbender, Westinghouse Lamp Division; E. W. Commery, General Electric Co. The Commercial and Industrial Lighting Planning Committee is now in the process of organization.

"We are confident that out of the deliberations and recommendations of these two committees," states Mr. Steinmetz, "the Bureau will be able to present to the lighting industry suggestions and materials for the greatest educational drive on Better Light Better Sight in the history of the industry."

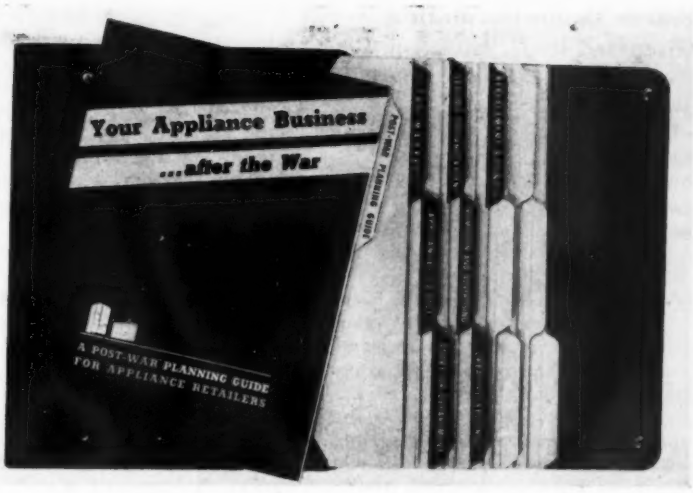
"The unprecedented activities in all classes of building, rehabilitation, and improvement already proclaimed by Government agencies, industry and social organizations of all kinds indicates a tremendous market for better lighting," Mr. Steinmetz points out, "and the need for a better public understanding and appreciation of better lighting for better seeing is more imperative than ever."

Kelvinator Distributes Postwar Planning Guide

Although Nash-Kelvinator's factories are still completely occupied with war production, and will continue to be so indefinitely, the Kelvinator Division of the Corporation has recently prepared and is currently distributing to Kelvinator appliance retailers a comprehensive post-war planning guide to aid them in making their basic preparations for post-war merchandising.

"This post-war planning guide is primarily a 'thought starter' and organizing tool containing ideas and suggestions which we believe will be helpful to appliance retailers, irrespective of any actual date when they may have new merchandise to sell," said Charles T. Lawson, general sales manager of Kelvinator.

The guide itself consists of a "plan book" containing practical and helpful basic information and planning suggestions under the following headings: The market; the appliances to sell; the store or department; the selling organization; the promotion and advertising; creative selling; and replacement business. Concrete questions are listed under each of these subjects to guide the appliance retailer's thinking in taking steps now to include all of these factors in both his short and long term post-war plans.



The Kelvinator Postwar Planning Guide that is being given to dealers.

Since planning for peacetime business is a continuous job, the guide provides a strong cardboard folder containing filing space for accumulating additional material under each of these headings. Thus the guide provides a convenient physical place as well as a set of mental tools to serve the retailer in formulating his post-war program.

As an indication of the kind of thing which gave rise to this Kelvinator post-war planning guide, Mr. Lawson states in an introductory paragraph:

> "The aggressive retailer who wants to build a sound, enduring post-war business will look beyond the first period of 'easy selling' that will come when appliances are again available. He will look to the 'settling down' period which will follow when real selling, based on the fundamental principles of appliance retailing, will be required for continued success in this business. Forward-looking retailers will recognize in this first post-war period an opportunity to build for the years to come.
>
> "This Post-War Planning Guide is the result of our desire to be of help to the retailers who will be selling our electrical appliances. Based on an intimate knowledge of what it takes to sell appliances in volume at retail, it provides a means of organizing the facts necessary for post-war planning."

The planning guides will be distributed personally by Kelvinator zone and distributor offices to Kelvinator retailers and to other appliance dealers whose progressive interest in post-war merchandising is known or is indicated to Kelvinator representatives.

Washing Machine Prospects For 1944 Still Indefinite

Shortages of manpower, materials, and production facilities make impossible the immediate resumption of manufacture of washing machines, War Production Board officials told industry representatives at a recent meeting of the Domestic Laundry Industry Advisory Committee in Washington. It was pointed out that prospects for turning out a limited number of machines in the latter part of 1944 are still indefinite, and will depend in large part on military developments and trends in war production.

Factors operating against immediate resumption of production are: (1) the importance of keeping the industry on war work just as long as its facilities are required; (2) the necessity for giving manpower priorities to essential war industries; (3) the lack of a sufficient supply of certain raw materials, such as copper, to permit mass production of washers; and (4) the absorption by war contracts of a large proportion of subcontracting facilities which normally provide component parts, such as aluminum

(Continued on page 58)

Future Radio Possibilities Discussed by G. E. Executive

The General Electric Company announced recently a reservation plan for the purchase of post-war radio broadcasting equipment, requiring the deposit of United States war bonds with the company in sums varying with the amount of equipment reserved for post-war delivery.

The plan will help General Electric prepare for an orderly transition from wartime to peacetime manufacture, and help keep workers at their jobs, Paul L. Chamberlain, in charge of sales for the company's transmitter division, told a meeting of fifty General Electric sales executives, newspaper and magazine representatives at the Waldorf-Astoria Hotel. "It will also support the war effort and enable broadcasters to make a definite reservation for equipment to be built and delivered as soon as conditions permit," he explained. The plan is being mailed by the company to the industry.

Pointing out that General Electric is building almost a million dollars worth of military radio every working day, Mr. Chamberlain said that the company in the post-war period will be able to furnish the broadcaster everything from microphone to antenna, including buildings, and will finance the whole transaction if the broadcaster's credit is good.

W. R. David, in charge of broadcast transmitter sales for the G-E transmitter division, told the group that "FM (frequency modulation) radio stations will eventually supplant all local, most of the regional, and some of the high power AM stations now in operation." He predicted that five years after the war there will be 500 FM stations in operation (as compared with about 50 today) and 750 AM stations. The United States also will have 100 television stations (as compared with nine today) and 50 international shortwave stations in operation at that time, Mr. David said.

He predicted further the extensive use after the war of "wireless" FM networks. Whereas their use is limited today because it is necessary for each station in the chain to pass the program along to the next station, Mr. David said that "tomorrow's wireless FM networks will differ from today's in that the relay transmitters will be operated on very high frequencies. They will be small units with highly directional antennas located at strategic high points and probably operated automatically," he explained. "Such stations may be set up as a public utility, similar to the telephone system, or they may be set up as an auxiliary operation of the major networks. In this type of wireless network, the intermediate broadcast stations will not be responsible for passing the program on to the next station."

In the areas where FM stations are now operating, there is an immediate potential post-war market for 12,500,000 home radio receivers with the FM band, he said, and there is another big market in car radios with this same FM service. The American public after the war will probably consider a radio receiver without FM as being obsolete, and this will furnish a strong incentive for the purchase of sets with the new kind of reception service included, the group was told.

Water Supply Equipment Production Increased

Because of the consistent improvement in the raw material situation recently, farm pumps and water systems are being produced in steadily increasing quantities and the flow of units to dealers is being increased monthly.

This was the optimistic report on the domestic and farm water supply situation made at two meetings of representatives of manufacturers of electric farm water systems, pumps, wind mills, and allied products at the Sherman Hotel, Chicago, December 8 and 9.

The immediate postwar objective of the industry is the production of 500,000 electric farm pumps and water systems in the first year after Victory. The ultimate goal is to have running water in every home in the United States.

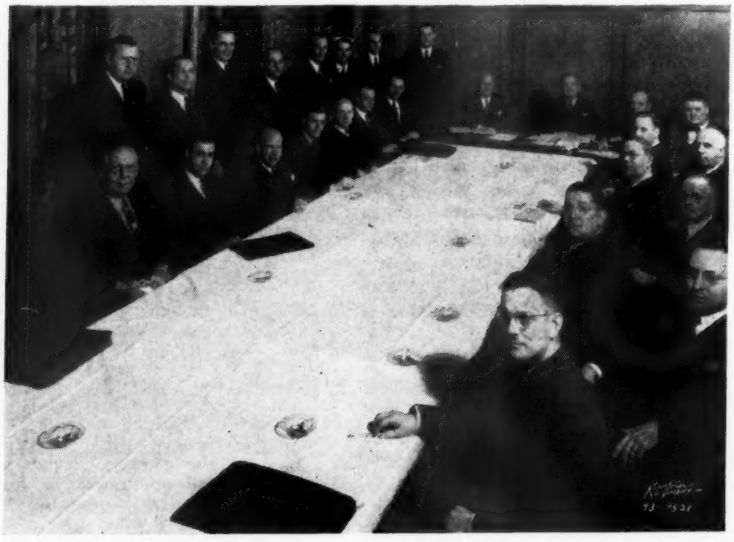
So definite has been the improvement in the output of water systems that there is every indication that the backlog of orders now on manufacturers' books will be entirely absorbed by July 1, 1944, it was predicted at the meeting.

The difficulties now being encountered by the manufacturers are chiefly in connection with obtaining fractional horsepower motors, switches, and bearings in adequate quantities. Another problem is that presented by the draining off of skilled personnel by the armed services.

These problems, however, are being solved with the assistance of the WPB and the OCR both of which recognize the importance of running water in the nation's food production program. It was reported that OCR contemplates adding water systems to the list of "essential welfare items."

Water systems are now being

(*Continued on page 58*)



Water supply equipment manufacturers meet to discuss postwar plans.

Westinghouse to Expand Air Conditioning Activities

To prepare for post-war expansion of air conditioning activities, the Westinghouse Electric and Manufacturing Company has announced the transfer of all heavy duty air conditioning and industrial refrigeration manufacture from its East Springfield, Mass., Works to the Jersey City, N. J., plant of the Westinghouse Electric Elevator Company.

"We believe that air conditioning will become a more important industry in post-war America, and it is our intention that Westinghouse shall continue as one of the major producers in the field," said George H. Bucher, president.

An important reason for making this move at this time, according to Mr. Bucher, is to release space for the present vital war work at the East Springfield Works of the Appliance Division. At the same time the accommodation of air conditioning manufacture at the Elevator Company will not interfere with the current war production at the plant. Industry has learned during this war, as never before, the advantages of air conditioning to increase efficiency, production and quality. The millions of workers who have enjoyed its benefits are going to want those same benefits in their homes. These and other factors indicate to us that the air conditioning industry is about to come into its own.

Simultaneously, Frank C. Reed, vice president of Westinghouse and president of Westinghouse Electric Elevator Company, announced the appointment of Ross Rathbun as manager of air conditioning, and of Walker G. White to succeed Mr. Rathbun as general sales manager of the Elevator Company. The Elevator Company, for its production of elevators, gun mounts and other heavy items of war equipment, was one of the first companies in America to receive the Army-Navy "E" pennant, to which was recently added its third star for continued excellence of performance.

Springfield will continue to manufacture lighter air conditioning, commercial refrigeration units and household refrigerator units. All other units of what will be a greatly enlarged line of equipment will be produced in Jersey City.

Ross Rathbun

Duke Takes Over Durham Property on January 1

The sale of the Durham Public Service Company at Durham, N. C., to the Duke Power Company for a basic consideration of $2,952,000 was approved Dec. 1 by the Federal Power Commission and the Securities and Exchange Commission, and it is expected that the transfer will be completed by Dec. 31, with Duke Power taking over Jan. 1.

R. L. Lindsey, president and general manager of the Durham utility, who will remain in charge after the transfer is completed, says that it is hoped to complete negotiations so that Duke Power can take over at the beginning of the calendar year. He says that "a lot of odds and ends" will remain to be settled after the first of the year, but that this would not hold up the transfer.

Duke Power's lower electric rates are to be put into effect in the Durham area as soon as the transaction is completed, Mr. Lindsey says, and the step, in his opinion, will save Durham consumers approximately $75,000 a year, the principal saving being reflected in the bills of those who use more than 50 kilowatts per month.

Durham Public Service serves customers in Durham, and rural areas in Chatham, Granville, Orange and Wake Counties. Duke Power is acquiring all electric facilities and other properties owned by Durham Public Service, including motor bus lines and ice plants. Electricity and transportation franchises already have been granted Duke Power by the Durham City Council, and the sale also has received the approval of the North Carolina Utilities Commission.

COMPLETELY SEALED DISTRIBUTION TRANSFORMER—This 25 kva, 2400 volt unit is almost ready to take its place "on the line" with many others of similar construction — recently built by Westinghouse for a midwest utility company. The welded cover and solder-seal bushings make possible the new air-tight design.

Restrictions on Copper For Fuses Is Removed

Restrictions on the use of copper and copper base alloy in renewable electric fuses and electrical wiring devices were removed today by the War Production Board. Steel has been used in the manufacture of these products under the provisions of Orders L-161 (Electric Fuses) and L-277 (Electric Wiring Devices) since issuance of the orders in August, 1942, and April, 1943, respectively.

The return to permitted use of copper and copper base alloy, effected by amended versions of both orders issued today, will result in a considerable saving in man-hours, increased production, and more satisfactory products. Production of electric fuses has been seriously curtailed by the additional screw machine time required to process steel, and by the difficulty in obtaining prompt deliveries of steel rod. Wiring devices made from steel corrode after a few week's use, it has been found, and become inoperative.

Control over the distribution of the products remains unchanged, except that a rating of AA-5 or higher is required instead of a rating of A-l-j. This change is made to conform with over-all changes in the rating structure.

Non-renewable fuses are still subject to the restrictions on the use of copper and copper base alloy.

Oklahoma Association Names 1944 Officers

At a directors meeting in Tulsa, Okla., December 17, the Oklahoma Utilities Association elected the following officers for the coming year: E. C. Jouillan, Consolidated Gas Utilities Corp., to succeed J. C. Happenny, Oklahoma Power and Water Co., as president, George McLean, Oklahoma Gas and Electric Co., Oklahoma City, vice president; A. F. Potter, Gas Service Co., Bartlesville, second vice president; D. S. Kennedy, Oklahoma Gas and Electric Co., treasurer; and Miss Kate A. Niblack, secretary.

Directors are: A. F. Potter, Bartlesville; W. O. Smith, Ada; J. P. Arnold, Tulsa; George A. Davis, Oklahoma City; J. C. Happenny, Sand Springs; E. C. Jouillan, Oklahoma City; R. K. Lane, Tulsa; Glenn C. Kiley, Oklahoma City; Frank B. Long, Tulsa; S. I. McElhoes, Chickasha; and W. L. Woodward, Alva.

Short Line Extensions Authorized by OWU

Electric and gas utilities have been authorized to build short line extensions to serve a substantial number of consumers who have previously been unable to obtain service, the Office of War Utilities announced December 10 in releasing a series of amendments to supplementary orders governing utility operations.

New electric and gas service lines heretofore have not been available to persons living outside critical housing areas, except when they were built as a part of a war housing project. An amendment to Supplementary Utilities Order U-l-f, issued today, removes the restriction that limited utility construction of this type except in critical housing areas.

Changes in other orders made concurrently with the amendments of U-l-f make available for use by electric utilities many types and sizes of wire from excess inventories, which were previously frozen. Steel wire primaries are no longer required in rural construction. In addition, construction standards for all types of utility construction have been altered to permit more extensive use of now idle material of other kinds.

Other minor changes have been made in amendments to Supplementary Orders U-l-a, U-l-c, and U-l-d. Supplementary Order U-l-b has been revoked and is superseded by U-l-d and U-l-f, which retain the substance of the revoked order.

Changes just announced will speed up new service by relieving utility companies of substantial amount of paper work.

Higher Priority Required For Fluorescent Fixtures

New fluorescent lighting fixtures may be bought under blanket MRO ratings, including ratings extended under CMP Regulation No. 5, only if purchase orders carry ratings of AA-1 or AA-2, according to an amendment to Order L-78 (Fluorescent Lighting Fixtures) issued December 9 by the War Production Board. The amendment is designed to prevent the purchase of these fixtures for relatively non-essential uses on blanket MRO ratings.

Electric Space Heaters May Be Authorized

There is talk in Washington of starting the production of electric space heaters made of non-critical materials, "McCall's Magazine" for January reports to its 3,500,000 readers in its Washington Newsletter feature. One of the materials under discussion and experimentation is asbestos cement; another is glass.

Authorization Expected For 64,000 Electric Ranges

Permission to produce 64,000 domestic electric ranges of the three-burner, apartment house type in 1944 is expected to be granted to manufacturers in areas where labor and facilities are available, the War Production Board announced early in December. An order setting forth the regulations governing such production will probably be issued at an early date.

The ranges will be produced under a special emergency program designed to meet the most essential needs of the armed services, hospitals, and Federal Housing Administration public housing projects and to provide essential replacements for civilians who have been or are now using electric ranges.

Production at the rate of a maximum of 16,000 electric ranges per quarter would be about 10 per cent of the 1941 production rate. This number of ranges will not satisfy all the demands built up, as a result of the long discontinuance of production and virtual disappearance of inventories, but it is expected to take care both of essential war needs and of essential replacements demands in cases where existing electric ranges are beyond repair or have been moved to another location.

Distribution of ranges that can be made available for retail sale to civilians will be strictly controlled. For the time being, ranges will be transferred to the armed services, hospitals, and housing projects in the customary manner, upon submission of written application on Form WPB 1319, approved on the basis of essentiality of need. Should future developments make it necessary, the existing procedure may be revised.

A manufacturer's eligibility to participate in the emergency program will be dependent upon his ability to produce electric ranges with a minimum drain on facilities and manpower needed for direct war work. Consequently, only a small proportion of the 24 former electric range manufacturers will be authorized to produce ranges under this plan.

Stock Contribution Improves Carolina Utility Position

The North Carolina Utilities Commission on December 16 authorized the Carolina Power and Light Company of Raleigh, N. C., to reduce the outstanding number of shares of its preferred and common stock and to lower its capital stock liability by $1,680,600.

The reductions, according to L. V. Sutton, president of the company, are made possible by gratuitous contributions of preferred and common stock held by the National Power and Light Company in Carolina which are being made in line with the dissolution of the National Power and Light Company and the disposition of its holdings under an order of the SEC.

Mr. Sutton said that "shares of stock contributed by National will be cancelled and that the cancellation further will improve the capital structure of the company by approximately $118,000."

HERE'S THE *Conservice Program* YOU ASKED FOR...

AND IT'S EVEN BETTER THAN LAST YEAR'S!

BETTER CARE
LESS REPAIR
1944 CONSERVICE PROGRAM
✓ New Streamlined Conservice School including Sound-slide Training Films, Conservice Guides and Dramatic Demonstration Boards
✓ New "Better Care - Less Repair" School for Homemakers
✓ Revised "Care and Use" Book
✓ Newspaper Mat Service

It checks on every count in meeting the objectives of the National Appliance Conservation Activity

Again—it's CONSERVICE for '44. New, Improved, Better! And more necessary than ever! Here's how it adds up—

1st. It Sells Conservation. Appliances are vital. All of us—consumers, retailers, manufacturers—must help keep them running. This Conservice Program shows —and tells—how!

2nd. It Helps You "Maintain" QUALITY Repair Service. Provides training for new service people, through our new, streamlined Conservice Training Schools.

It's a Program for NOW! Tied right into the nationwide "Better Care—Less Repair" Activity. Concentrated to help your country —your customers—YOU!

52-Page Wartime CARE AND USE BOOK. Millions are already using it...millions more need it. The biggest good-will builder you ever bought for a penny.

NEWSPAPER MAT SERVICE. To tell *how* to take better care of appliances...*why* you can't give instant repair service... offer the "Care and Use" Book. *Your* advertisements, for your store. Mats available free.

A New CONSERVICE SCHOOL FOR HOMEMAKERS. An actual "school" to teach homemakers how to change fuses, make simple repairs on cords, plugs, etc. A natural for retailers with facilities for group meetings.

NEW CONSERVICE TRAINING SCHOOL. To train new service people. Last year's schools improved. Streamlined to fit in with your war-busy service schedule. Be sure your new people attend.

See your Westinghouse Electric Appliance Distributor. Order "Care and Use" Books and newspaper mats through him. Check him for details on the Homemakers' Conservice School. Ask the dates of the Dealer Training Meetings.

PERSONAL NOTES
About Men You Know

Roland R. Davis, a veteran of 36 years' service with the Westinghouse Electric and Manufacturing Company, has received the Order of Merit, highest award the company gives to employes.

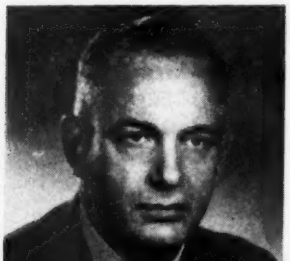
Mr. Davis, assistant to the general advertising manager in the Pittsburgh headquarters office, was presented with the Order and a bronze placque by **G. Edward Pendray** (at right in photo), assistant to the president of Westinghouse.

The plaque, designed by the noted sculptor Rene Chambellan, bears a silver "W" and the inscription "Whom his fellow men delight to honor". A certificate that accompanied the placque cited Mr. Davis "for his able service in the advertising department over many years; his wide acquaintance with the company and its practices, which have made him a key person in the office management of this complex activity; his unfaltering loyalty to the company and to his work, and his persistence in accomplishing what he sets out to do."

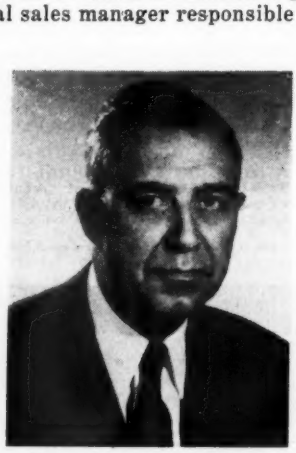
Graduated from the University of Pittsburgh with an electrical engineering degree in 1905, Mr. Davis joined Westinghouse as an engineering apprentice at the East Pittsburgh Works. A year later he was sent to the Philadelphia office as advisory engineer and salesman. In 1908 he went with a paper company as electrical superintendent but returned to Westinghouse in 1910. In 1925 he was named assistant to the publicity department manager and six years later became advertising manager. He has held his present post for the last two years.

* * *

Announcement is made by **P. M. Bratten,** general sales manager, Frigidaire Division, General Motors Corporation of the appointment of **H. F. Lehman** as assistant general sales manager in charge of Appliance and Commercial Sales and Service Departments, and **L. A. Clark** as assistant general sales manager responsible for all advertising, sales promotion, training and other related activities. Mr. Lehman formerly was manager of the Frigidaire Commercial and Air Conditioning Sales Division and Mr. Clark's former position was advertising and sales planning manager.



H. F. Lehman



L. A. Clark

* * *

M. F. Balcom, vice president of Sylvania Electric Products Inc., and a member of its board of directors, has just been made a member of the firm's Quarter-Century Club, marking his 25th year with this large manufacturer of vacuum and gas-filled electronic tubes.

M. F. Balcom

One of the outstanding figures in the growth of the Pennsylvania branch of the company, Mr. Balcom became purchasing agent of the Novelty Incandescent Lamp Company, a predecessor of Sylvania, in 1918. Previously he had served in financial and executive capacities with several other concerns, having begun his business career as a messenger for the First National Bank of Emporium, Pa.

* * *

Chris F. Tonne has joined the All-Steel-Equip Company, Inc., of Aurora, Illinois, as advertising manager. Formerly, he was advertising and sales promotion manager of Hough Shade Corporation, Janesville, Wisconsin. Mr. Tonne has had more than seventeen years of experience in industrial advertising and sales promotion.

* * *

J. S. Buchsbaum has been appointed sales promotion manager of the Standard Transformer Company, Warren, Ohio. Mr. Buchsbaum was formerly connected with the Ohio Public Service Company, of Warren.

How to Choose a Good Location for a Postwar Appliance Store

That's the Subject of Hotpoint's Bulletin No. 2 in "Planned Electrical Merchandising" Series

Typical of the practical help offered retailers for postwar planning is Hotpoint's Bulletin "How to Choose a Good Location for an Appliance Store." There are 23 rules explained in detail in this bulletin. Be sure to get it, and others in the series.

If you're not on the mailing list already, better send in your name right away. You'll receive the first bulletin and others at 30-day intervals. They are mailed immediately, *without charge*, to any retailer who wants them—not only Hotpoint dealers or prospective dealers, but *any* retail merchant who is sufficiently interested to write requesting them. Use the coupon below.

One Purpose — to Help Dealer

These bulletins are about *your* business. *Your* store, *your* customers right in *your* community — not about Hotpoint products. They are loaded with practical, field-tested suggestions that will help any merchant improve his business volume.

Arming for Peace

The retailer who is best prepared with sound knowledge about store location, the secrets of display, making customers buy, etc., will be fortified in the postwar period like a sniper in a pillbox.

Subjects to Be Covered

The titles of the first six bulletins give a good idea of their subject matter. 1. *"Plan Now for the Appliance Store that Will Help You Sell."* 2. *"How to Choose a Good Location for an Appliance Store."* 3. *"Planning Your Type of Store."* 4. *"Stocking an Electrical Appliance Store."* 5. *"Floor Arrangements Which Help You Sell."* 6. *"Advertising to Bring Them into the Store."*

This is too important to put off. Mail coupon today.

Edison General Electric Appliance Co., Inc.
5614 West Taylor Street, Chicago 44, Illinois

FOR OUTSTANDING ACHIEVEMENT IN WAR PRODUCTION

ELECTRIC **Hotpoint** KITCHENS

REFRIGERATORS • RANGES • WATER HEATERS • WASHERS AND IRONERS
CLOTHES DRYERS • AUTOMATIC DISHWASHERS • ELECTRASINK • STEEL CABINETS

Edison General Electric Appliance Co., Inc.
5614 West Taylor Street, Chicago 44, Illinois

Name_____ Title_____
Owner, Manager, etc.

Firm Name_____

Address_____
Street City State

WHAT'S AHEAD

G-E RESEARCH SCIENTISTS FORESEE THESE SIX IMPROVEMENTS IN FLUORESCENT LIGHTING

FLUORESCENT lighting has come a long way in the five years since General Electric first announced it to the American public and made the first installations at the New York and San Francisco World Fairs.

And it's going still farther. As a result of G-E research in fluorescent for war needs, G-E research scientists foresee additional improvements that can and will be made . . . improvements that will help produce a vast new postwar lighting market for G-E Lamp agents.

No, these improvements aren't all ready now. G-E engineers and research scientists are busy with urgent war tasks. But they will be ready as soon as conditions permit . . . and meantime millions of G-E Mazda fluorescent lamps in American war plants are helping bring that time nearer faster.

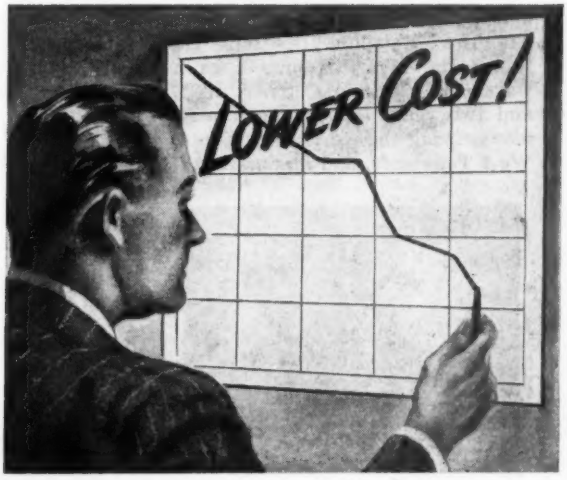
3 **Improved color quality,** thanks to new and better phosphors developed by G-E research.

4 **The G-E Watch Dog Starter** is already here. Faster starting — much greater uniformity. No blinking when tubes burn out.

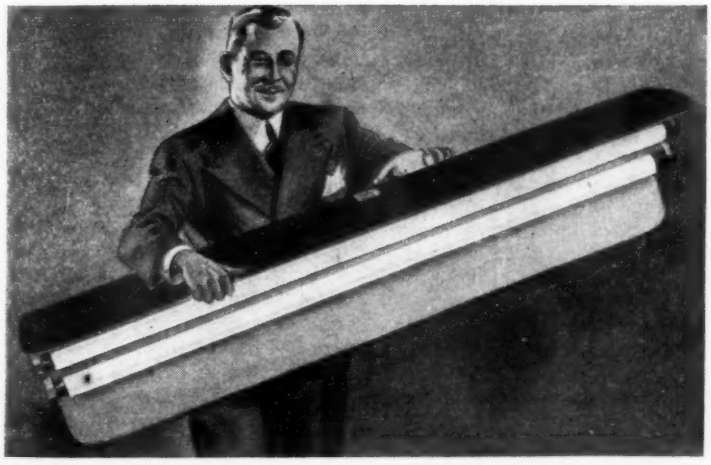
GENERAL ELECTRIC

IN FLUORESCENT

1 **Better lamp performance** throughout life as result of new type of cathode construction.



2 **Lower cost**—both on original installation and over a period of years.



5 **Better Fixtures**—more efficient and easier to install—through G-E's cooperation with fixture manufacturers.

"TO MAKE LAMPS STAY BRIGHTER LONGER"
The Creed of G-E RESEARCH

6 **Stay Brighter Longer,** through better maintenance of light output for the rated life of the tube. To make lamps . . . all types . . . stay brighter longer is the creed and constant aim of General Electric Lamp Research.

G-E MAZDA LAMPS

On December 1, **R. B. Sayre** will take up his duties as manager of Graybar's Memphis office. He replaces **O. B. Chandler** who died recently after twenty-four years of continuous service with the Company.

Mr. Sayre, whose service record with Graybar totals twenty-two years, has been closely identified with the electrical industry for many years, particularly throughout the Memphis district. He joined the Memphis branch as a warehouse clerk in October, 1921, and two years later became salesman serving the North Mississippi, West Tennessee, and Arkansas territory. In 1939, he was transferred to the Atlanta branch as manager, Outside Construction Department, which position he has held until his recent appointment.

R. B. Sayre H. B. Bibb

Horace B. Bibb will succeed Mr. Sayre in Atlanta as manager of Outside Construction Department. A native of Virginia, he was first employed by Graybar in Richmond in September 1914. Upon the opening of the company's branch in Charlotte he went there in charge of the warehouse, and shortly afterward became a traveling salesman. During 1928 he was appointed sales manager in charge of the company's branch in Norfolk. In 1935, he went to New Orleans in charge of merchandising sales and, upon the opening of the company's house at Columbia, South Carolina, he was transferred to that house.

* * *

Bruce W. Bennett has been appointed assistant general manager of sales of the American Steel & Wire Co., subsidiary of the U. S. Steel Corp. In his new post, Mr. Bennett will be in charge of the New York office of the company succeeding **Frederick Connell**, who is retiring after 45 years association with the Wire Company.

Born in Wilkes-Barre, Pa., Mr. Bennett first started working for the company in October, 1909, as a salesman in the electrical and wire rope department of the New York sales office. Five years later, he was transferred to Wilkes-Barre as a salesman in the same department. In January, 1929, he was appointed manager of sales of the Wilkes-Barre office, which post he has held to the present time.

* * *

Emory L. Puckett has returned to Atlanta, Ga., and is now associated with his father C. A. Puckett, 3090 Roswell Road, well known Atlanta electrical contractor. For the past 15 years, Mr. Puckett was connected with the City Electric Co., Inc., Syracuse, New York, calling on contractor, dealer and industrial accounts in central New York. He has had considerable experience in all types of wiring and lighting.

Emory Puckett

* * *

A 38-year-old engineer who developed some of the newest secret equipment used in military radio communications has been appointed associate director of the Westinghouse Research Laboratories, it was announced recently by **Dr. L. W. Chubb**, director of the Laboratories.

He is **John A. Hutcheson,** for the last three years manager of engineering at the Baltimore Radio Division of the Westinghouse Electric and Manufacturing Company. In that post he directed a large staff of engineers developing new types of radio equipment for the armed forces and designing secret electronic devices for military use.

Mr. Hutcheson's immediate assignment at the laboratories will be to direct wartime micro-wave research but his scope of responsibility will include all phases of research engineering.

Appointment of **S. D. Mahan** as director of advertising and public relations of the manufacturing division, The Crosley Corporation, Cincinnati, has been announced by **R. C. Cosgrove,** vice-president and general manager.

S. D. Mahan

For the past two and one-half years, Mr. Mahan has served the U. S. Treasury Department as director of advertising and promotion for the War Bond program and as associate national field director in charge of all War Bond and Stamp sales through retailers and the newspaper boys of the nation. He has been asked by the war finance division of the Treasury Department to continue his association with the above activities in the capacity of a consultant.

In his new connection with The Crosley Corporation, Mr. Mahan returns to the electrical appliance field where he spent over eight years, first as merchandise advertising and promotion manager and, later, as general advertising manager of the Westinghouse Electric and Manufacturing Company.

Previous to that, he was, for 12 years in agency work as vice-president of Fuller and Smith and Ross, and as account executive with the H. K. McCann Company, among others.

* * *

Appointment of **R. F. Tucker** and **Adolph Frankel** as staff assistants to the manager of the Westinghouse Lamp Division, with headquarters at Bloomfield, New Jersey, was announced recently by **Ralph C. Stuart,** manager.

In their new posts, the two men will assist Mr. Stuart in coordination of the manufacturing, engineering and sales activities of the four Lamp Division plants.

Still Present or Accounted For!

These Norge executives are working for today . . . planning for tomorrow

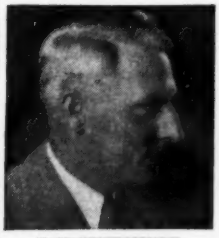
I like to refer to these Norge executives as my veterans, for in truth that is just what they are—veterans in the business of producing and marketing household appliances, and veterans in the business of expediting and producing materials for war.

To these men must go much of the credit for the swift and efficient manner in which we now turn out more than forty intricate products needed by our armed forces. And theirs will be the task of helping us swing back to the production of Norge household appliances after the war. Meanwhile they are working for today and *planning for tomorrow.* And Norge dealers will like the *products of experience* these men will have for them soon after we get the "go-ahead" signal.

Howard E. Blood
PRESIDENT AND GENERAL MANAGER

R. W. GIFFORD
Vice-Pres. and Asst. Gen. Mgr.

M. G. O'HARRA
Vice-Pres. in Charge of Sales



H. H. WHITTINGHAM
Vice-Pres. in Charge of Engineering

JOHN PARK
Secretary and Treasurer

P. H. PUFFER
Director of Postwar Planning

E. J. KANKER
Assistant Sales Manager

J. M. TENNEY
Refrigerator Sales Manager

E. R. BRIDGE
Laundry Equipment Sales Mgr.

A. H. KITSON
Electric Range Sales Manager

W. M. DAVIS
Home Heater Sales Manager

C. H. MacMAHON
Advertising Manager

You'll have a great future with

NORGE

A BORG-WARNER INDUSTRY

ARCH BLACK
Export Sales Manager

NORGE DIVISION, BORG-WARNER CORPORATION, 670 E. WOODBRIDGE ST., DETROIT 26, MICH.
Only prewar producer of a complete line of—ROLLATOR REFRIGERATORS ★
ELECTRIC RANGES ★ WASHERS ★ GAS RANGES ★ HOME HEATERS ★ COMMERCIAL REFRIGERATION

. . . electricity and GRAYBAR have grown up together. Through peace and war, with every electrical advance, GRAYBAR has extended its distribution services in step with the needs of the day . . . and of the Nation.

Sure, it's something for GRAYBAR to be 75 – but all the busy years behind us mean nothing to you, or to America, except as they have improved our perspective for today's first job.

In a modern war, every industrial method or technique is a weapon matched against the production forces of the enemy. In your job, you have to help outclass some of Hitler's crowd this very morning. So have we at GRAYBAR, and we can't do it with our heads turned toward the past.

Thus, we're chiefly glad to be 75 because the amassed experience of those years – the long slow process of "learning the ropes" – is helping us meet each new and critical problem of electrical supply and distribution better than we could hope to do as a youngster at the game. And we can't imagine a better use to make of it.

Beyond that, we think the perspective of many years of peace-time electrical progress – antedating even lamps and motors – will help us to serve you better in the "conversion" and post-war years. (As for the jubilation, we'll save that to add to yours on V-day!)

GRAYBAR *in War* . . .

PRODUCTION SUPPLY – Electrical parts and materials to be installed in ships, planes, communications units and other "fighting front" equipment are GRAYBAR'S No. 1 responsibility today. With them goes specialized service to aircraft plants, shipyards and all other key war plants; on selection, procurement and delivery.

CONSTRUCTION SUPPLY – Back of America's mighty war plant – military and industrial – is a phenomenal construction job. Electrical contractors, engineering firms and the military services engaged in the work depended upon GRAYBAR as a time-saving connecting link with the makers of thousands of different electrical construction items.

MAINTENANCE SUPPLY – To keep our productive machine running full-tilt, to distribute power, to light the work, and maintain communication lines, GRAYBAR speeds electrical replacement parts to points of greatest need. Emergency procurement "via GRAYBAR" has saved millions of productive man-hours.

FIRST Service of Supply for an Electrical Nation

*GraybaR

QUALITY

SINCE 1869

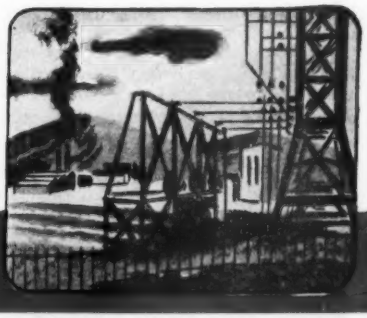
* REG. U.S. PAT. OFF.

GraybaR

MOBILIZATION POINTS IN OVER 80 CITIES

Bringing together more than 200 manufacturers...20,000 customers

GRAYBAR *in Peace*



CONTRACTOR'S SUPPLY – The peacetime job of reequipping America electrically will get its start with electrical contractors: Plants, homes, offices, institutions, stores and buildings will be demanding betterments. To contractors, GRAYBAR will once more bring the newest and best in wiring materials, lighting units, signaling equipment.

APPLIANCE DEALER SUPPLY – To dealers handling electrical appliances, GRAYBAR will again be back with the fast-moving, popular items that help build a sound and solvent business. With so much new and untried merchandise coming to market, you'll appreciate GRAYBAR'S help in selecting the better lines.

REHABILITATION SUPPLY – Distribution services, tailored to the electrical reconversion needs of industrial plants, public utilities, municipalities, railroads, telephone companies, etc., will be more essential than ever. Experienced GRAYBAR specialists will again be devoting themselves to the special electrical needs of each such group.

NEW EQUIPMENT and MATERIALS

Lighting Design Booklet

There's a vast difference between installing lighting units and providing lighting in accordance with special seeing requirements. The latter requires the services of a lighting specialist and the results of his survey results in "design for efficient industrial seeing". Because of his recommendations workers are enabled to produce faster and more efficiently.

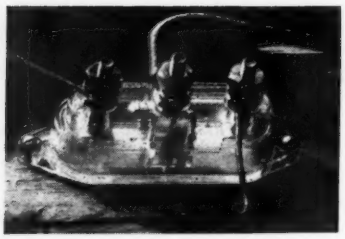
To help all those persons in industry who must consider lighting-for-seeing problems, the Fostoria Pressed Steel Corp. has produced a brochure with the title "Design For Efficient Industrial Seeing." Readers interested in the valuable information contained in this brochure may obtain a copy by writing to the Fostoria Pressed Steel Corp., at Fostoria, Ohio.

Plastic Lightning Arresters

Lightning arresters housed in transparent Tenite plastic are being used in the communications systems of the Signal Corps and other branches of the armed forces. In the presence of electrical discharges during thunder storms, the glow of a small neon tube visible within the transparent Tenite housing indicates a satisfactory connection between aerial and ground.

The electrodes sealed within the Tenite housing are protected from the effects of the weather, dirt, and insects, which often affect the uniform operation of arresters. Tenite is shatterproof and dirt-resistant.

The lightning arrester housings are molded by Sterling Plastics Company, Union, New Jersey, and manufactured by L. S. Brach Manufacturing Corporation, Newark, New Jersey. Tenite is a product of Tennessee Eastman Corporation, Kingsport, Tennessee.



200-Watt Industrial Fixture

As the third step in providing a complete series of fluorescent lighting fixtures for areas where high levels of illumination are required, or where high-bay mounting is necessary, Sylvania Electric Products Inc. announces its new model HF-235R industrial fluorescent unit. This unit uses two 100-watt lamps and is of the same basic streamlined design as the recent 40-watt lamp models.

Suited to individual or continuous-row mounting, the fixture may be suspended as wanted: by direct chain suspension, direct conduit mounting, messenger cable-clamp assembly, or surface mounting with bolt or lag screw.

Designed to produce maximum light intensities with a minimum use of critical materials this high power factor fixture conforms to all WPB requirements. The top housing encloses the ballast for protection, and complete hanging flexibility is assured through one-half inch knockouts located on 24, 30, 36 and 47¾ inch centers. Chain-hanging brackets are also built into the top housing.

A single piece of non-metallic reflector board, finished in Sylvania's Miracoat high-temperature baked enamel, furnishes high reflectivity (86 percent). Ease in maintenance is guaranteed by the convenient lo-

cation of starters between lamps, and by the fact that a quarter-turn of the "Captive Latches" will remove the reflector from the top housing.

Addition of a simple, inexpensive joining strap adapts HF-235R units for joining end-to-end in continuous row installations. The fixture is available on priority of A-1-j or better, and shipment is scheduled approximately two weeks after receipt of the order.

The new unit rounds out Sylvania's line of "Fluorescents For The Future" and supplements the predecessor fixtures, HF-100R and HF-150R industrial fluorescent units.

New Maintenance Publication

"Allis-Chalmers Operation and Maintenance Review" is a new pocket-sized magazine succeeding Allis-Chalmers' "Victory Production and Maintenance News."

Illustrated with eye-catching color cartoons, the publication aims to broaden interest in problems of wartime maintenance. It contains maintenance tips from Allis-Chalmers engineers, as well as timely articles on current trend for the shopman and the executive. It also invites an exchange of ideas on operation and maintenance from equipment users. The "Review" will be issued bi-monthly.

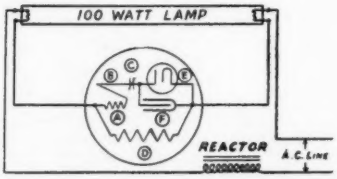
New Square D Bulletin

Bulletin 3100 (Dated November 1943), fully describes, illustrates and lists all Square D electrical equipment meeting Marine and Naval requirements. Supersedes temporary Bulletin 3100 (dated April, 1943) and gives considerable more information as well as illustrating and describing Square D electrical equipment for use in yards and docks, plus typical shipboard layouts. 28 pages. Address Square D company, 6060 Rivard Street, Detroit 11, Michigan, for free copy.

100-Watt No-Blink Starter

The Bryant Electric Company has announced a "No-Blink" Starter, FS6-NA, for 100 watt fluorescent lamps. The outstanding features of this new starter is that it automatically locks out a deactivated lamp; and automatically restores to normal operation when a new lamp is installed.

The FS6-NA for 100 watt lamps, like the FS4-NA for 40 watt lamps, has the time-proven Bryant glow switch which provides perfect starts on normal lamps. In addition it has a bi-metallic element which automatically opens the glow switch circuit after a few unsuccessful attempts to start a deactivated lamp.



When a lamp becomes deactivated it will not light, then low resistance (A) which carries the starting current, gradually heats up bi-metal (B) which opens lockout contacts (C) in the glow switch (E) circuit. Open circuit voltage then exists across resistor (D) which draws a negligible

The "BIG 5" launches the 1944 G-E appliance service program

COMING YOUR WAY IN MARCH!

1 ANOTHER "WARTIME SERVICE COLLEGE"

Featuring Repair and Care of G-E Electric Ranges and Water Heaters

Sitting-in at a General Electric Service Training School is one of the best investments any appliance service man can make. Coming your way in March is another in the series of meetings to keep you up-to-the-minute on wartime service and repair of G-E appliances.

RANGES AND WATER HEATERS FEATURED . . . Interesting movies, slide films and demonstrations have been arranged to fill you chock-full of information about oven calibrations and adjustments, plus cooking unit repairs and tips on how to handle customer complaints. *And don't forget, a complete new manual on G-E range servicing will be ready for you.*

AND REFRIGERATORS . . . Including introduction of the FEA sealed refrigerator unit designed to replace many of the older Monitor Top models.

1944 PLANS REVEALED . . . Including General Electric's advertising and service promotion plans for 1944. Just because General Electric isn't manufacturing electrical appliances during wartime, don't think G.E. is allowing the public to lose touch! You'll hear what General Electric is doing to help dealers maintain their place in the appliance limelight.

AND THE FUTURE . . . The future possibilities in the electric appliance industry will be discussed. Representatives of the General Electric Company will be there to talk about post-war sales potentials.

TWO NEW SERVICE MANUALS FOR YOU . . . One on G-E Ranges; the other on G-E Refrigerators with Scotch-Yoke machines. The finest and most complete yet compiled. Get them at the March schools!

2 ANOTHER GREAT "T" PLAN HOME STUDY COURSE! . . . .

The "T" Plan on G-E Refrigerators was so enthusiastically received by more than 4000 General Electric servicing dealers that we now announce the second step in our home study program. This new complete course will feature G-E Ranges.

You can get ready now by making sure you subscribe to the "PRODUCT MAN," the monthly product service magazine. Ask your G-E distributor for more details.

3 A COMPLETE SERVICE INFORMATION LIBRARY . . . .

G-E servicing dealers have always been fortunate in having at their finger tips good printed information on the repair of G-E appliances, such as the Appliance Service Handbook . . . the monthly "PRODUCT MAN" . . . and manuals. The new manuals on refrigerators and ranges help complete this reference library.

4 G-E APPLIANCE SERVICE CENTERS TO SERVE YOU! . . . .

G-E factory-operated Appliance Service Centers have been organized to improve the flow of replacement parts to dealers, distributors, and utilities. They can help make repairs your shop is not qualified to make. They can help in the training of service manpower. They will counsel with you on any problem that has to do with parts, servicing, priorities, etc. Start 1944 by getting acquainted with the things these strategically located SERVICE CENTERS can do for you!

5 G-E PARTS AND REPLACEMENT UNITS . . . .

Thanks to the U.S. government, the cooperation of the appliance industry, and the thoughtfulness of millions of homemakers, the replacement parts situation for 1944 looks bright. Get the detailed story at the March meetings . . . and see:

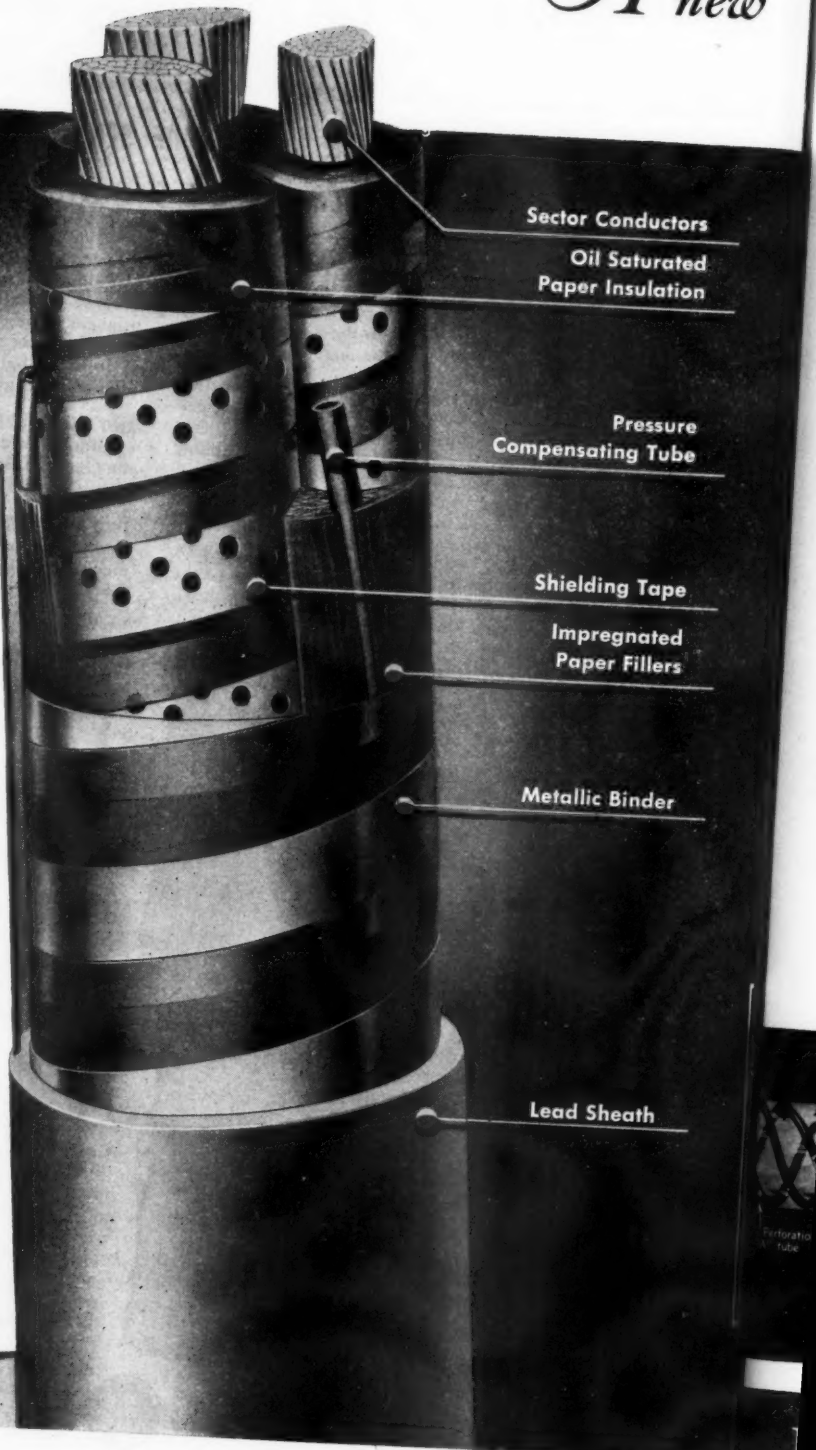
1. The new FEA sealed replacement unit for Monitor Top models.
2. The new Duracast Calrod Unit for the replacement of surface units on G-E Ranges.
3. The new thermostat for older G-E irons.

BETTER CARE — Conserve Electric Servants — LESS REPAIR

GENERAL ELECTRIC

Announcing . . . Type PC

A new



Its Advantages

1. Insulation maintained thoroughly saturated with compound at all times.

2. Internal pressure is stabilized within prescribed limits.

3. Controlled sheath stresses. There is no repeated expansion and contraction, no fatigue or splitting of lead.

4. Pressure along cable line is uniform, not variable from joint to center of section to joint.

5. Sheath supervision is not required. Failure rates from other than inherent causes too low to justify supervision.

6. Interchangeability. Cable can be spliced to existing solid type cable without difficulty.

7. Increased current carrying capacity. Many present-day limits are based on allowable sheath stress — type PC Cable controls these stresses.

8. Improvement in operating voltage stress is possible, since ionization and gas inclusions are eliminated.

9. Reduced overall transmission cost per KVA mile.

10. Strategic materials and metals may be saved.

Pressure Compensated Cable

development in Paper Insulated Power Cables

● HERE is an improved power cable that offers you all the usual advantages inherent in paper insulated cable, plus the additional feature of much greater operating reliability.

Type PC Cable differs from the ordinary "solid-type" paper insulated cable in only one respect—but an important one. Included in the impregnated fillers are one or more small lead tubes. By this unique and simple expedient is obtained stabilization of operating pressures within fixed limits.

The pressure-compensating "gas cushion" is the secret

Note the schematic diagram below. The helical tubes are filled with dry nitrogen gas and are perforated at intervals of approximately four times the length of lay. Perforations in the tubes are staggered so that there is a perforation—hence, contact between insulating compound and gas—every one and one-third lengths of lay. During manufacture, excess quantities of the cable saturant are forced into the several perforations.

When the cable is installed, slugs of the compound gradually collect in the low portions of the tubes. The gas collects in the domes.

During the application of the load, which causes expansion of the compound and increases the internal pressure, additional saturant is forced into the tubes through the perforations.

This merely compresses the gas entrapped between the slugs and thus acts as a cushion to prevent development of pressures which would normally stretch the lead sheath.

Pressure is very uniform along the entire cable length—there are no points of concentrated pressure—due to the fact that the maximum distance to points of pressure stabilization are equal to one-half the spacing between perforations.

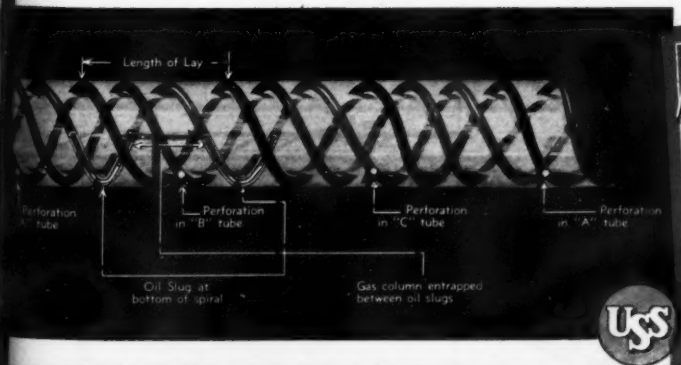
When the cable cools and the oil saturant contracts, the compressed gas in the tubes forces the oil back again into the cable, thus preventing wide swings from pressure to vacuum as encountered in ordinary "solid-type" cable.

In PRESSURE COMPENSATED Type PC CABLE the positive pressure operating characteristics of "oil-filled" and "gas-filled" cables are obtained at very moderate increase in cable cost and with practically no increase in either the cost or difficulties of installation and supervision. A bulletin on PC Cable has just been issued. Send for it.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* — United States Steel Export Company, New York

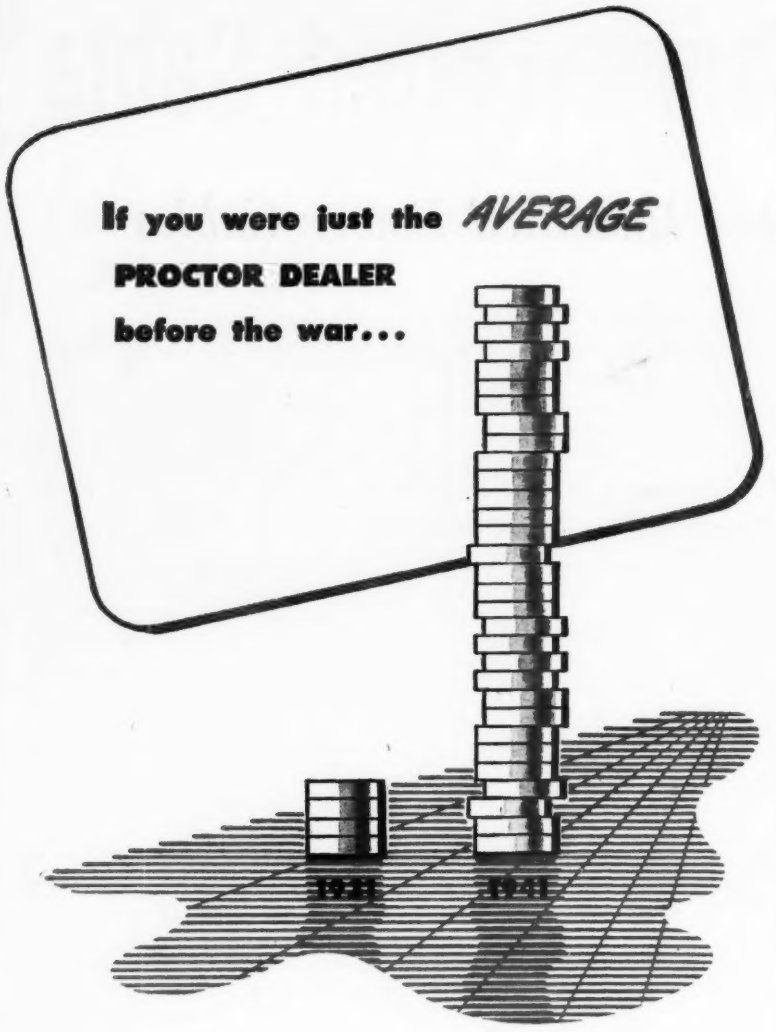

Length of Lay
Perforation in "B" tube
Perforation in "C" tube
Perforation in "A" tube
Oil Slug at bottom of spiral
Gas column entrapped between oil slugs

Awarded to the Worcester plants of American Steel & Wire Company

ELECTRICAL WIRES AND CABLES

Deliver the power that multiplies manpower

UNITED STATES STEEL



...YOUR SALES

OF PROCTOR ELECTRIC IRONS

shot up more than 1000% between 1931 and 1941! (Actual sales records prove it.)

TOMORROW...

you'll want to sell Proctor Automatic Appliances, because sales will shoot up again—sure as shootin'—when the shootin' stops!

PROCTOR

NEWSMAKER IN APPLIANCE MERCHANDISING

PROCTOR ELECTRIC CO., DIV., PROCTOR & SCHWARTZ, INC., PHILADELPHIA 40, PA.

current (less than 1 watt) but produces sufficient heat to hold lockout contacts (C) open. When the failed lamp is replaced the starter automatically resets to its normal position ready to function again. Condenser (F) eliminates radio interference.

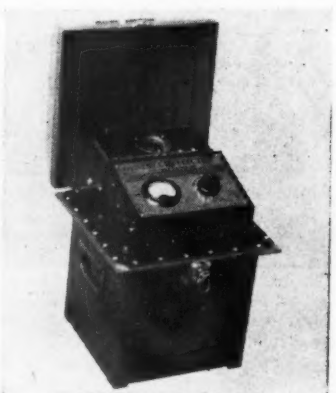
Principal advantages are: prompt action of automatic lockout stops blinking; perfect starts lengthen the life of lamps. There is no wear on the starter caused by futile attempts to start a deactivated lamp. Ballasts are protected against overheating.

Portable Oil Tester

An improved 30,000-volt portable test set for the convenient and rapid testing of insulating liquids such as oil and Pyranol has been announced by the General Electric Company. The set, designed for indoor service, provides smoothly variable test voltage from 0 to 30,000 volts on single-phase, 115- or 230-volt, 25- or 60-cycle circuits.

This portable tester can be used to advantage in industrial plants, central stations, substations, and wherever frequent oil testing is required, saving both time and expense in checking the proper dielectric strength of insulating liquids.

The tester combines in a single unit a step-up transformer, a potentiometer which gradually raises the test voltage, a voltmeter to measure breakdown values, an automatic circuit breaker, and an oil testing receptacle. The control panel is inclined toward the operator, enabling him to read the voltmeter easily and accurately. As soon as the test sample breaks down, the low-voltage breaker automatically opens the circuit, preventing continuation of the arc and burning of the electrodes. Complete instructions for operation are included on the surface of the control panel. The oil testing receptacle is located at the rear of the control panel under a hinged safety guard with a glass window.



IS YOUR POWER SYSTEM OVERLOADED?

Do You Want More Capacity . . . Quickly . . . Inexpensively?

CAPACITOR PLUG mounted on BUStribution DUCT (handle on plug cover permits operation from floor).

Capacitor Plugs help in these ways!

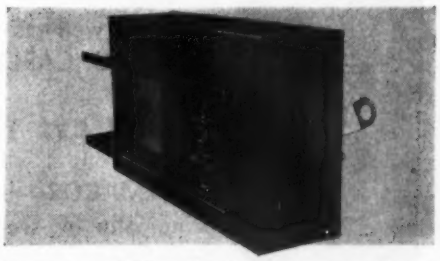
1. Inserted in any of the plug-in openings of your BUStribution DUCT, BullDog Capacitor Plugs increase the capacity of your electrical system by reducing the reactive KVA, thus ensuring lower operating temperatures and preventing needless fuse blows and production shutdowns.
2. They permit installation of Capacitors at the nearest point to your motors. As the load center shifts, the plug-in Capacitors can be shifted with it.
3. They represent a *decentralized,* and consequently more flexible, arrangement of Capacitors. Even if a unit should fail, the power factor correction of the entire system would not be affected, as it would with *centralized* banks of Capacitors.
4. They make possible the strategic location of Capacitors at the points in the system where poor power factor occurs, and this improves conditions for the rest of the equipment all the way back from the motors, through the bus duct, through the secondary switchboard, to the transformers.
5. Capacitor Plugs not only improve your power factor, but save valuable space and critical materials such as copper and steel . . . to say nothing of man-hours and production saved because of fewer blown fuses and greater operating efficiency.

BullDog field engineers are as close as your telephone for complete details . . . or write us direct.

FOR A BRIGHT FUTURE BUY MORE WAR BONDS

New BullDog Capacitor Plug

You don't have to worry about space or supporting means for these Capacitors. Just plug them into the BUStribution Duct. It's as quick and easy as that! Rated from 1 to 15 KVA, complete with fusible switch or circuit breaker in one compact handy Plug for 230V or 460V 60 cycle.



Rear view of Plug showing bus contact fingers for plugging into openings along bus duct runs.

Capacitor Plug with front cover removed, exposing fusible disconnect switch and capacitor unit.

BULLDOG

ELECTRIC PRODUCTS CO.

Box 177, R. Pk. Annex, Detroit 32, Michigan

BullDog Electric Products of Canada, Ltd., Toronto, Ontario

Field Engineering Offices in All Principal Cities

MANUFACTURERS OF a complete line of Vacu-Break Safety Switches, Panelboards, Switchboards, Circuit Master Circuit Breakers and BUStribution SYSTEMS.

● IMPERIAL NEOPRENE JACKETED PORTABLE CABLES ● PERMACORD ● LEAD-ENCASED AND PARKWAY CABLES ● SYNTHOL WIRES ● WELDING CABLES ● SHIPBOARD CABLES ● RUBBER POWER CABLES ● VARNISHED CAMBRIC CABLES ● ARMORED CABLE ● CRESFLEX NON-METALLIC SHEATHED CABLE ● SERVICE ENTRANCE CABLE ● BUILDING WIRE

CRESCENT PERMACORD

Heavy Duty Portable

CORDS and CABLES

CRESCENT PERMACORD is a tough, flexible, heavy duty portable cord or cable for use on INDUSTRIAL portable drills, appliances, construction and mining machinery and welding equipment.

Durable--

The flexible, rubber-insulated copper conductors are enclosed in a protective jacket of rubber, vulcanized to an outer covering of heavy, impregnated, hard-twisted Seine twine. This construction gives maximum flexibility and protection from abrasion, crushing, heat, oils, greases and weathering. PERMACORD is made in sizes from No. 18 AWG to 1,000,000 CM, as well as in standard sizes of WELDING CABLE.

Proven in Service--

PERMACORD has been used for years principally by steel mills and mines for their most severe portable cable jobs.

CRESCENT INSULATED WIRE & CABLE CO.

CRESCENT
WIRE and CABLE

Factory: **TRENTON, N. J.** — ***Stocks in Principal Cities***

SOUTHERN REPRESENTATIVES

ATLANTA, GA.
Edgar E. Dawes
A-4 Rhodes Bldg. Annex

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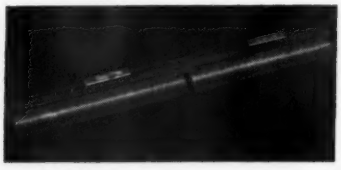
Paul Hogan, Jr.
823 Perdido St.

DALLAS, TEXAS
M. C. Huie
707 Thomas Bld.

Smithcraft Offers 8'6" Units

In strict compliance with government orders limiting the amount of metal in fluorescent lighting fixtures, Smithcraft of Chelsea, Massachusetts, has pioneered the development of a continuous fluorescent lighting system using basic sections 8-foot 6-inches long. For that reason, their report of considerable savings on installation costs is particularly interesting.

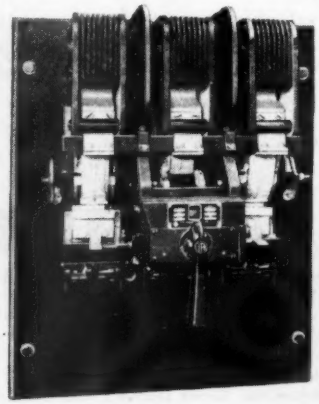


Smithcraft engineers point out that one piece 8-foot 6-inch units involve up to 50% less installation labor and may be hung on 8-foot centers. It is claimed that these units, together with 4-foot 3-inch fill-in sections, provide an efficient and economical method of installing a sufficient number of units in any run to obtain illumination levels of 50 or more foot candles.

New Air Circuit Breaker

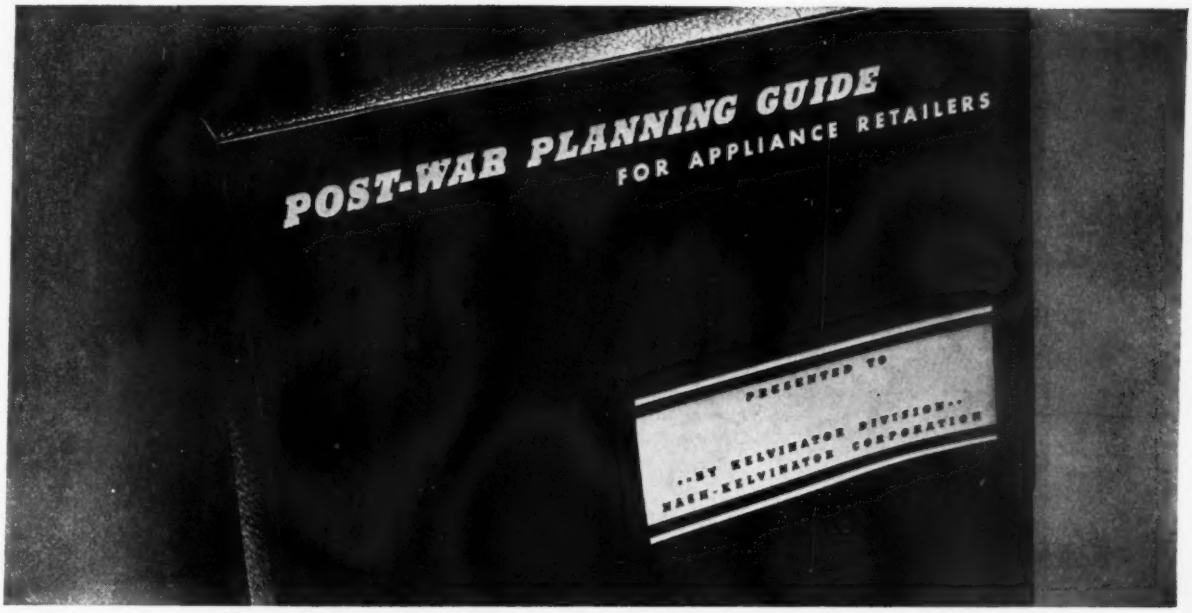
A new trip-free air circuit breaker, known as Type KC, with an interrupting rating of 50,000 rms amperes, is offered by the I-T-E Circuit Breaker Co., Philadelphia, Pa. Ratings are 600 volts a-c, 250 volts d-c, 100 to 1600 amperes. Operation may be either manual or electric; one, two, and three pole styles are offered. Mounting may be on open type (live-front) or dead-front switchboards or in individual steel enclosures of general purpose of weatherproof construction.

Construction features include silver-alloy main contacts brazed to solid-copper contact blocks, auxiliary



Another "Retail-Minded" Program from Kelvinator

A SIMPLIFIED POST-WAR PLANNING KIT



The First Complete and Usable Plan of Action Offered Appliance Retailers . . .

Every day brings us closer to that time when electric appliances will again be available for retail sale. This new Post-War Planning Guide can be of tremendous assistance to Kelvinator retailers in organizing for both the sudden, immediate post-war appliance demand and the long-pull business of the years to come.

Provides a Framework to Build on . . .

This Kelvinator Post-War Planning Guide is a practical, down-to-earth pattern for organizing a retailer's own operation, a framework for his own facts and figures. It brings up direct questions and tells how to go about finding the answers. The result can be a factual means of selecting the merchandise to sell, the volume to plan on getting, the sales organization required, and the selling space needed.

Covers Post-War Appliance Problems

Every retail problem can be organized under one of the seven main headings found in the Guide . . .

1. **The Market**
2. **The Appliances to Sell**
3. **Store or Appliance Department**
4. **Selling Organization**
5. **Advertising and Promotion**
6. **Creative Selling**
7. **Replacement Business**

Sound answers to problems under all of these, can be arrived at through the procedure set up in this amazingly simple planning kit.

A Constant Up-To-Date Record of Post-War Topics . . .

Planning for peace prosperity is a continuous job. There are 12 indexed folders in the kit in which the retailer can keep an active ready-reference file on reprints of articles, statistics, literature; in fact, everything that may have a bearing on post-war business.

Another Result of "Retail-Minded" Action in Wartime . . .

This Post-War Planning Guide is another convincing piece of evidence of Kelvinator's consistent "Retail-Minded" Action in Wartime! Kelvinator retailers may obtain the Post-War Planning Guide at no cost, upon request to their local Kelvinator Zone or Distributor.

The men and women of the Propeller Division of Nash-Kelvinator Corporation have been awarded, and proudly fly and wear, the famous Army-Navy "E" for high Achievement in War Production.

and arcing contacts which are also made of silver-alloy and magnetic arc chutes with blowout coils and iron vanes. Manual operation makes use of a large, pistol-grip handle which requires turning only ninety degrees to open or close the breaker. Electrically operated breakers are provided with a unit-type solenoid mechanism and a trip-free closing relay.

The attached photograph shows a manually operated type KC circuit breaker. A complete description is given in Bulletin 1301, which may be obtained from the I-T-E Circuit Breaker Co.

Century's New Protected Motor

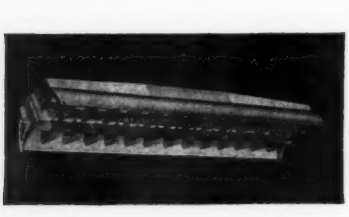
Century, Form J, general purpose, open rated motors in a new protected design are available in sizes from 1½ to 15 horsepower. The upper half of the end bracket is closed to minimize the possibility of dripping liquids or falling solids entering the vital parts of the motor.

Two powerful fans located behind the bearing brackets draw cooling air through the bearing bracket openings, around the bearings, across the windings and to the air passages between the outer surfaces of the magnetic core and the frame—the heated air being expelled through openings at the side and bottom of the frame.

A new bulletin, 6-1, describes these motors in detail. For your copy write direct to Century Electric Co., 1806 Pine Street, St. Louis, 3, Missouri.

Louvred Fluorescents

A new eggcrate-louvred luminaire conforming to latest W.P.B. metal limitations has just been announced. This new model—the Futurliter—will produce high intensity, comfortable-quality illumination for offices and drafting-rooms in this nation's war-plants.



A foremost feature of the Futurliter is the low maintenance-cost. By reason of its open-type construction, bugs and loose-dirt fall to the floor; further the vertical louvres and sidewall surfaces make it difficult for dust to settle. This all adds up to greater light-utilization with a minimum servicing cost.

Designed for close-ceiling or ceiling-suspensions, the Futurliter can be mounted singly, or end-to-end in continuous runs for 50 to 75 foot-candle installations. Each 48" unit can be had for use with either 2 or 3-40 watt lamps. Further the Futurliter is available with conventional ballasts with starter switches, or with the new super-powered Quick-Liter ballast which uses no starter switches, lights quickly, operate at lower voltages and at low temperatures. Futurliters are available for immediate shipment. For further information, write to The Edwin F. Guth Company, 2615 Washington Ave., St. Louis 3, Mo.

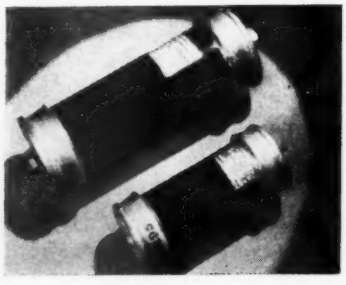
Porcelain Clad Capacitors

For high voltage d-c applications where space is limited, new solder-sealed porcelain-clad type FPC Interteen Capacitors are announced by Westinghouse Electric and Manufacturing Company.

From 7,500 volts up to and including the 200,000 volt class, the capacitor elements are hermetically-sealed in a tubular, wet-process porcelain body with solder sealed end closures. The end closures act as the capacitor terminal by connecting the element leads at opposite ends, utilizing the porcelain tube as insulation.

By eliminating the large metal case and bushings required by metal case capacitors, the new porcelain-clad capacitors help maintain minimum over-all dimensions. Larger types are furnished with or without cast mounting flanges. Where castings are used, the capacitors are solder-sealed, then castings are cemented on with mineral-lead compound.

Additional information on type FPC Capacitors may be secured from Dept. 7-N-20, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Penna.



New G-E Vacuum Switches

Four new vacuum switches for a wide variety of radio and industrial switching applications have been announced by the Tube Division of the General Electric Company's Electronics Department at Schenectady, New York. They can also be adapted to oil- or water-immersed operation because of their enclosed construction and are especially applicable for hazardous installations where fire and explosion are a constant risk, as in flour mills, magnesium rooms, and similar dust-laden atmosphere. Two of the new switches are also designed for high altitude applications.

Since the contacts of the switches are mounted in a vacuum, they are relatively free from the effects of corrosion and arcing, and are unaffected by dirt or oxidation. The vacuum-type construction also gives the switches a high current rating for their size and permits them to handle enough power to operate equipment at greatly reduced voltages.

Operating without auxiliary contactors or relays, the switches can be used on installations where space is at a premium, as in airplanes. No self-contained coil or other operating mechanism is built into the switches. Movement is obtained from the mechanism to be controlled, or from other apparatus to suit the application. This movement can often be provided by a slow-moving cam or by the movement of a thermostat, as in air-conditioning or refrigerating equipment. Air or liquid bellows, a rod-linkage system, or almost any other means can be used to operate switches fo this type.

An external fulcrum is eliminated by the use of a flexible diaphragm which transmits movement to the contacts and acts as a natural fulcrum point for the operating arm. The contacts close without vibration, making it possible to mount these switches on or near delicate instruments.

New Electrical Books

Aircraft Electrical Engineering

By Randolph Matson. Published by McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 18, N. Y. Illustrated, 372 pages. Price, $3.50.

In this book of timely significance, the author meets the need for a text designed specifically for those courses in aircraft electrical engineering which prepare the student as directly as possible for activities in the electrical group in engineering departments of aircraft manufacturers.

The latest developments in aircraft electrical engineering, includ-

FROM EVERY STANDPOINT . . . A STANDOUT FOR WORK AREAS IN WAR INDUSTRY

MITCHELITE
Model No. 2077

"MITCHELITE" *for Industrial Lighting*

These rugged, lightweight, all-purpose fluorescent fixtures are doing a great lighting job in war industry today. MITCHELL innovations make them simpler . . . more flexible . . . more economical to install and service. And they're tops in lighting efficiency. MITCHELITE accessories provide for every method of mounting or hanging . . . individual or continuous row. 5 Models answer every need: 2 and 3-light units using 40-watt lamps; 2-light unit using 100-watt lamps. U.L. and FLEUR-O-LIER APPROVED.

Individual or Continuous Row

Model No. 2032
(Four 40 Watt Lamps)

U. S. Pat. No. 2,336,414

U. R. C. Research Luminaire *for Offices and Drafting Rooms*

America's No. 1 Commercial Fixture! Uses four 40 watt lamps in such a scientific manner as to provide the ultimate in high intensity illumination with low surface brightness (glare). Mounted on tracks—requires less time to install than any other commercial fixture. Surface or Pendant mounting—individually or in continuous rows. Now uses less than 6 lbs. of metal. Available at the original low price!

Pendant or Surface Mounting

Individual or Continuous Row

Get Free Catalogs from your **MITCHELL DISTRIBUTOR** *or write to us*

MITCHELL *Manufacturing Company*
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MITCHELL FLUORESCENT

ing many new and special topics that have not heretofore been published, are given particular attention.

The first part of the book is devoted to drawing practices, and wiring diagrams as they relate to aircraft. These chapters are followed by chapters on wiring, power supply systems and equipment, power plant electrical equipment, electric motors and power drives, lighting, and special features of wiring such as bonding and shielding.

Since the radio and instrument installations are closely related to the electrical installations, a chapter on each is included.

In addition to its function as a text, this book will be found helpful as a reference work by those actually engaged in aircraft electrical engineering and in designing electrical equipment for use in airplanes.

The Mathematics of Physics and Chemistry

By Henry Margenau and George Moseley Murphy. Published by D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York City, N. Y. Illustrated, 581 pages, 6½x9¼. Price, $6.50.

In this new publication, the authors have aimed to present between the covers of a single book those parts of mathematics which form the tools of the modern worker in physics and chemistry. They have chosen a middle course between the mere recording of facts and formulas, typical of handbook treatments, and the ponderous development which characterizes treatises in special fields.

The scope of the work is indicated by the chapter headings: Mathematics of Thermodynamics; Ordinary Differential Equations; Special Functions; Vector Analysis; Vectors and Curvilinear Coordinates; Calculus of Variations; Partial Differential Equations of Classical Physics; Eigenvalues and Eigenfunctions; Mechanics of Molecules; Matrices and Matrix Algebra; Quantum Mechanics; Statistical Mechanics; Numerical Calculations; Linear Integral Functions; and Group Theory.

The usefulness of the text has been increased by the inclusion of fully worked illustrative examples here and there, and the addition of numerous problems throughout the book confirming and supplementing the ideas of the text. Answers to the problems are usually given. The degree of difficulty of the treatment of the subject material is such that a Senior majoring in physics or chemistry would be able to read most parts of the book with understanding. The comprehensive index should make the work especially useful as a ready reference to graduate students and scientists whose memory of specific mathematical details is dimmed.

Circuit Analysis of A-C Power Systems—Vol. I.

By Edith Clarke. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Illustrated, 540 pages. Price, $6.00.

Problems confronting the electrical engineer in connection with present-day power systems will be more easily solved with the aid of this new book by Miss Clarke who is associated with the Central Station Engineering Division of the General Electric Company.

Among the important problems of the transmission engineer are those which have to do with the magnitudes and distribution of currents and voltages during normal and abnormal operating conditions. Some of these are under steady state, while others are under fault conditions, such as occur during lightning and other disturbances. The methods of analysis given in this book embody the results of long study and experience. They enable accurate answers to be obtained to many problems that, not long ago, were considered incapable of solution. The book has been written according to a plan of starting with fundamentals and including charts and tables representative of modern transmission system practice so that it will be useful to advance students as well as to practicing engineers.

This first volume, dealing with symmetrical and related components, will be followed by a second volume, now in preparation, which will give additional characteristics of synchronous machines, equivalent circuits for types of transformers not included in the first volume, characteristics of insulated cables, etc.

Encyclopedia of Substitutes And Synthetics

Edited by Morris D. Schoengold. Published by Philosophical Library, Inc., 15 East 40th St., New York City, N. Y. 382 pages. Price, $10.00.

This new and unusual book lists thousands of raw materials, chemicals, processes, substitutes, synthetics, all in alphabetical order for easy reference. It covers products which have been recently developed to replace critical materials and discusses substitutes of interest to all branches of industry, manufacture and pharmaceutics from aluminum to quinine.

The encyclopedia also includes comprehensive explanations of plastics and other synthetics. It does not merely list these products but includes information on properties, solubility, substitutes, uses, processes.

CHROMALOX

HEATFLO

the replacement range unit

Five minutes with screw driver and pliers puts a new Heatflo unit to work. Snap-on adaptor rings fit any range, any type of opening. When a customer reports a sick unit, send a man with a Heatflo. One short call does it—brings pleasure to the customer, profit to you. Write.

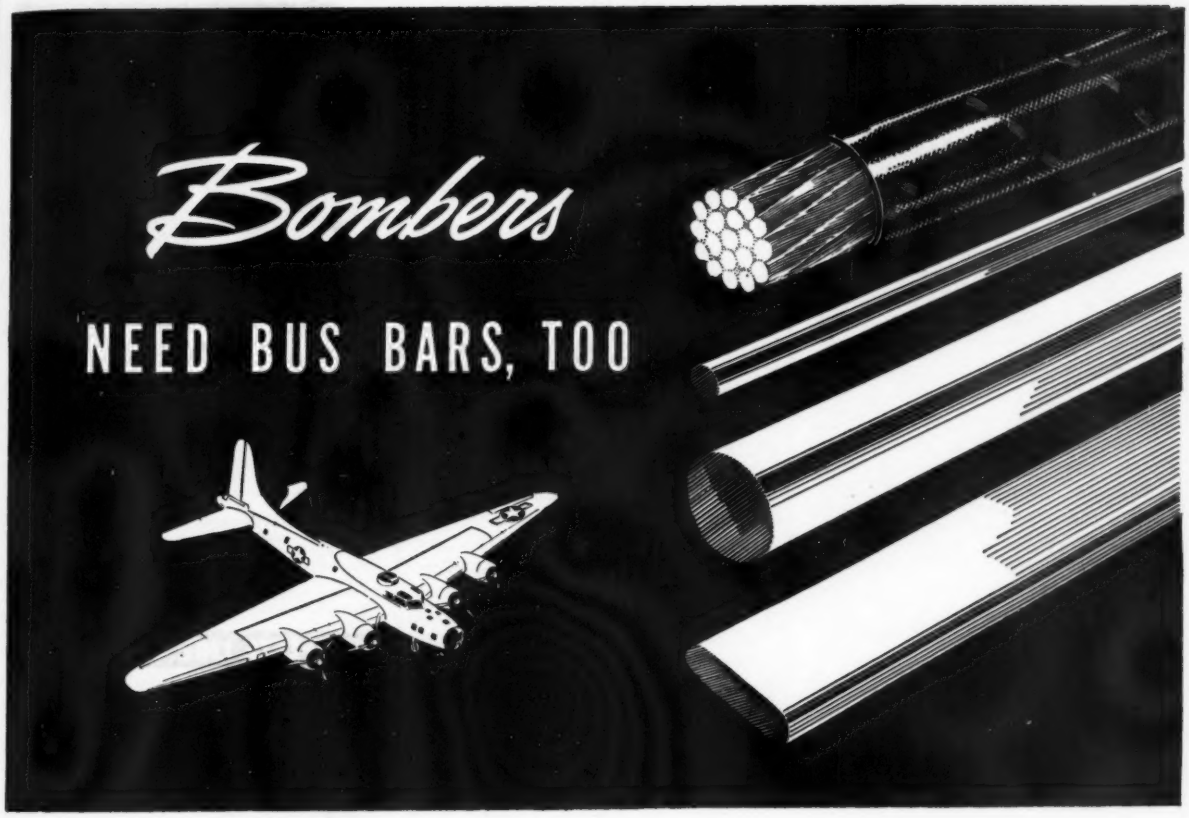
Chromalox Range Unit repair parts available without priority, under WPB limitation orders.

ATLANTA, GA.
C. B. Rogers
1000 Peachtree St., N. E.

RALEIGH, N. C.
W. R. Phillips

DALLAS, TEXAS
L. R. Ward
403 Southland Bldg. Annex

EDWIN L. WIEGAND CO.
7600 Thomas Boulevard
Pittsburgh 8, Penn.

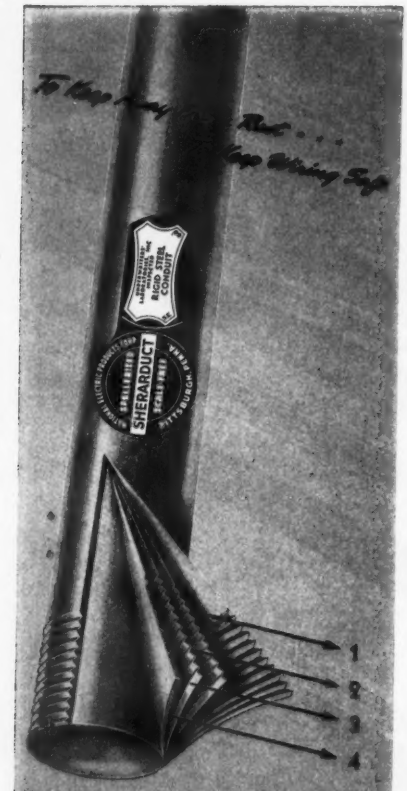


With electric motors for a bomber's accessory equipment ranging into dozens of horsepower, considerable electricity has to be distributed to many points throughout the plane. Bus systems have become regular networks—"like all downtown", says one engineer—so that their weight introduces a serious problem.

Aluminum buses, in the sizes and forms pictured above, are helping to take care of this weight problem. For aluminum, as you know, though high in current-carrying capacity, is likewise light in weight. Aircraft engineers are profiting by the properties of aluminum which long ago led electrical men to adopt it for *their* power lines and buses.

Whether your specialty is airplanes, power lines, heavy machinery, walkie-talkies or household appliances, versatile aluminum offers you many other advantages. It is nonmagnetic, nonsparking and nontoxic. It is an excellent conductor of heat and reflector of light. Its ability to resist corrosion is, of course, well-known.

Manufacturers of materials for war are constantly discovering new ways of bettering their products by employing Alcoa Aluminum. Our engineers are available for assisting in this work. ALUMINUM COMPANY OF AMERICA, 2164 Gulf Building, Pittsburgh, Pennsylvania.



ENGINEERS SPECIFY "SHERARDUCT" RIGID STEEL CONDUIT

1 Sheradization which impregnates zinc

2 Surface zinc over the alloy may be as thick as desired

3 Alloy composed of surface steel and zinc making a new metal, zinc-steel alloy

4 "Premium" steel costing more per ton than ordinary merchant pipe

Sherarduct

* Threads as well as interior have equal protection with the outer wall of the conduit.

National Electric
PRODUCTS CORPORATION
Pittsburgh, Pa.

Washing Machine 1944 Prospects Indefinite

(Continued from page 33)

castings, electric motors, and ball bearings, for non-integral washing machine manufacturers.

It was acknowledged, however, that plans for a reconversion program should be laid now, since the problem connected with reconversion are considerably more complex than those associated with conversion of the washing machine industry to war work. An amendment to liberalize Limitation Order L-6, to make larger quantities of materials available for repair parts for washing machines now in home was recently issued. A second amendment to the existing order, which will further liberalize the production of repair parts and which is expected to be issued at an early date, was discussed.

In this connection, committee members emphasized that existing domestic washing machines are being put to much greater use today than ever before, owing to curtailment of commercial laundry facilities and the lack of new machines. They stated that it was therefore necessary to assure a continuous flow of repair parts into consumer markets by allotting considerably more material for production of parts if the WPB objective of maintaining present equipment is to be met in 1944.

Water Supply Equipment Production Increased

(Continued from page 34)

manufactured under order L-257 which permits manufacturers to make 67 per cent of their 1941 production. This is exclusive of parts made for repairs and replacements. A motor and a pump are considered a replacement item.

Indicative of the recognition by the WPB of the importance of water systems in the nation's food production program are two orders which are helpful to manufacturers in their effort to catch up with the accumulated backlog of demand. One of these authorizations permits manufacturers to order their entire year's supply of raw materials in advance instead of on a quarterly basis. Manufacturers have recently been notified by the WPB that their allocation of tonnage for 1944 is the same as for 1943.

NEW SMALL RADIUS BENDERS STOPS KINKS

Forming small-radius bends in tubing, conduit or pipe, without wrinkles, kinks, or serious distortion is a simple task with Greenlee Hand Benders. They form neat bends for sharp nooks and corners . . . eliminate manufactured bends and fittings . . . save up to 75% in time and material on many jobs. Special clamping device prevents slipping . . . stops kinks.

NEAT BENDS ENHANCE APPEARANCE OF JOB!

Shown above is a series of bends in thin-wall conduit made with a Greenlee No. 764 Bender. These smooth, small-radius bends eliminate fittings and provide a finished appearance to the job. On this high-production machine, fittings were used only at the end connections.

Available to essential users, Model No. 761 bends pipe and rigid conduit (IPS); No. 763 handles steel, copper, brass, and aluminum tubing; No. 764 for thin-wall conduit (EMT). *Write for more information—ask for new circular S-120.*

COMPLETE LINE OF BENDERS

For any bending job there is a Greenlee Bender, including powerful hydraulic benders for conduit pipe and tubing from 1¼" to 4½" size. They are easily operated by one man and are compactly built into one unit. They save the cost of many manufactured bends. Portable, they are easily carried to the job and set up.

HYDRAULIC PIPE PUSHERS

Here is another Greenlee tool that saves hours of work and conserves manpower. When installing iron pipe or concrete duct underground, use a Greenlee Hydraulic Pipe Pusher. It's the only fast, easy method of installing pipe without tunneling, without digging or backfilling long trenches, without cutting pavement or tearing up road beds.

As shown at right, only a short trench is needed to accommodate pusher and pipe. One man can operate. Here, with a Greenlee No. 790 Pusher, 4" pipe was pushed a distance of 55 feet under the double, main-line tracks of railroad. Thru pipe main power lines were laid between two buildings. On jobs like these, the savings pay for a Greenlee Pusher on the first or second job. *For more information, ask for Bulletin No. S-117.*

WRITE FOR FREE COPY CATALOG 33-E

Greenlee TOOL CO.
1761 COLUMBIA AVE., ROCKFORD, ILL.

Provisions affecting the drilling of wells have also been liberalized recently. The procedure for drilling new wells and repairing old wells has been simplified. A rating of AA3 has been assigned to well drillers for casing and other supplies.

In summing up the general outlook for water systems in 1944, Herbert C. Angster, secretary-director of the National Association of Domestic and Farm Pumping Equipment and Allied Products Manufacturers, said:

"Our condition is a very favorable one. It is getting better all the time. The WPB has assured manufacturers repeatedly that they will get every component part they need. All manufacturers of water systems are approaching their quota. It will, of course, take time to supply jobbers with stocks. The raw materials which manufacturers obtained in the last quarter of 1943 will not make themselves felt until the first six months of 1944. Manufacturers have a greater problem in converting from wartime production to the making of normal peacetime products than in converting from normal to wartime manufacture because of the loss of skilled personnel. However, water systems will soon begin to roll and the industry will be caught up with rationed orders by July 1, 1944."

Meter Tags Reduce Fuse Change Calls

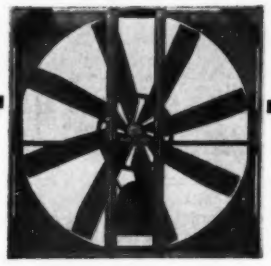
(*Continued from page 31*)

sales floor in the form of a demontration board with picture. All appliance service bills are accompanied by a slip telling of the simplicity of the fuse replacement.

The results have been encouraging although there is still much more to be done. Fuse replacement calls to customer's homes during the last six months of 1943 compared with the last six months of 1941 were off 23 per cent. The first five months of 1943 showed 24 per cent reduction from the first five months of 1942.

There are still 400 to 500 calls per month and many of these can be eliminated when customers understand how quickly and easily they can restore their service by having extra fuses on hand and making their own fuse replacements.

NOW IS THE TIME TO SELL
. . . NEXT SUMMER'S NEEDS



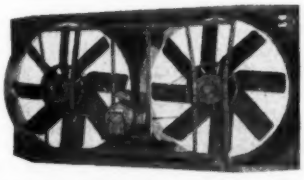
Coolair
TRADE MARK
Exhaust FANS and BLOWERS

WHILE WPB Regulations do not permit us to accumulate a warehouse stock of Coolair Fans, our plant has been able, up to now, to make reasonably prompt shipment on all priority rated orders.

But this favorable situation may not prevail at the time your customer plans to install Coolair Fans for ventilating and cooling workrooms and processing spaces in his plant.

For this reason we urge you to survey his needs, sell the order now and place it with us while we still have the production capacity and necessary materials and supplies for their manufacture and in this way insure prompt delivery of his complete order when needed.

Should CMP Regulation 5 not cover his requirements, help your prospect prepare and file form PD-1A with his nearest WPB Field office.



TWIN UNIT FAN: Widely used where limited headroom or vertical wall space does not permit use of adequate sized single unit Coolair Fan.

PROMPT SHIPMENT . . . can still be made on many types and sizes of Coolair Fans on orders bearing a priority rating of AA-5 or better.

A full description of the Coolair line, with tables showing models, dimensions, performance data, etc., can be found in
SWEET'S CATALOG A.S.H.V.E. GUIDE
ELECTRICAL BUYER'S REFERENCE

AMERICAN COOLAIR CORPORATION
3604 MAYFLOWER STREET JACKSONVILLE 3, FLORIDA

A NON-METALLIC FLUORESCENT UNIT

for Offices and Drafting Rooms

Here's a unit with typical Curtis character . . . a touch of modern functional design . . . Easy to install . . . either single pendant or single ceiling mounted . . . perfect for continuous lines . . . High in efficiency and low in maintenance expense . . . Metal channel of the unit well within government limitations . . . louver and reflector made of less critical materials . . . finished in Curtis FLURACITE.

Let the Curtis "Warrior" help you sell your next lighting job.

SPECIFICATIONS MAINTENANCE: The louver assembly consists of bottom, sides and ends assembled in one unit. Releasing two spring catches on either side of the fixture permits it to hinge from the remaining two spring catches for cleaning and lamp replacement. To remove completely release all four catches. WATTAGE: For four 40-watt fluorescent lamps.

We are proud to have been awarded the Maritime "M" for outstanding achievement in production of war material.

New Orleans Representative: Mr. W. J. Keller,
304 Natchez Bldg., New Orleans 12, Louisiana

CURTIS *Lighting*, INC.
6135 WEST 65TH STREET, CHICAGO 38, ILLINOIS

This gives you some idea of the difference in efficiency and RESULTS—when you use the ultra-modern BRIEGEL METHOD of making thin wall conduit connections instead of many old-fashioned methods still on the market.

You conserve critical steel—Briegel fittings are made with 25% less steel than any other fittings on the market.

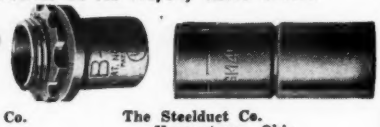
You save time—just two squeezes with the patented B-M "indenter" (illustrated at left) and a smooth, clean connection is made. No extra turns or twists—no nuts to tighten. Up to 50% saving on precious time!

You save materials—fewer items to buy and handle. MORE PROFIT ON EVERY JOB!

Approved by Underwriters' Laboratories.
Prompt Deliveries on All Properly Rated Orders!

THE ONLY TOOL YOU NEED
(COSTS JUST $1.25)

DISTRIBUTED BY



The M. B. Austin Co.
Chicago, Ill.
Clayton Mark & Co.
Evanston, Ill.
Clifton Conduit Co.
Jersey City, N. J.
General Electric Co.
Bridgeport, Conn.
The Steelduct Co.
Youngstown, Ohio
Enameled Metals
Pittsburgh, Pa.
National Enameling & Mfg. Co.
Pittsburgh, Pa.
Triangle Conduit & Cable Co.
New Brunswick, N. J.

BRIEGEL METHOD TOOL CO., Galva, Ill.

No Jobs Too Large Or Too Small

(Continued from page 25)

other electrical businesses in Memphis. The company did a big volume of business in 1941—pretty close to $368,000—and consequently is still enjoying the benefits. However, a large portion of the materials Slater is now using comes from completed Army projects—materials that were leftovers declined by the Army and which Slater was permitted to purchase for his own use. He has handled some of the biggest Army construction jobs in this section during the last three years.

The Government shell-loading plant at Milan, Tennessee, provided a $365,000 contract for Slater. The Walnut Ridge and Newport Army Air Fields, both in nearby Arkansas, ran about $160,000 each. The company only recently finished parts of several of the Government projects and has its eyes open for other possibilities.

The Slater company is encountering some unusually tough electrical problems on the government contracts, naturally. But there's a bright side to that, too.

"We believe that problems we have to solve now will help us just that much more in the postwar construction boom," Slater smilingly explains.

"There's bound to be tremendous residential, business and industrial expansion in the mid-South with the advent of peace. We intend to be ready for it and get our share. Industry already is moving South.

"Back in 1927, we landed the largest single electrical contract that had ever been awarded in Memphis up until that time — a contract on the new $3,000,000 Sears, Roebuck & Company building here for almost $400,000. We won that one over some of America's largest electrical contracting concerns and did such a good job that we have handled the several additions to the Sears building.

"We've also handled such big Memphis jobs as the wiring of the Medical Arts building and the Buckeye Oil Mill addition, among many others."

Slater doesn't mind admitting that he started out in the electrical business with nothing but ambition to succeed some 44 years

ago. It wasn't long before he was in business for himself, and then his climb up the ladder was rapid. Many who were his early customers are still his customers.

His son, W. F. Slater, a Cornell engineering graduate, was associated with him for a short while before going into business for himself in Memphis. Now the W. F. Slater Engineering Corporation is a valuable "family" business link. Many air conditioning jobs handled by the younger Slater provide electrical contracts for the father.

It all adds up to business—not business as usual — but enough business to keep going without complaining. And that's something, these days!

Postwar Planning For Inspectors

(*Continued from page 24*)

tions in small towns and rural sections or else admit that inspection is a racket. We must have some real action rather than a lot of flowery speeches in order to get the necessary results and gain the confidence of the public and the rest of the electrical industry, which the electrical inspector should and must deserve.

These problems must not only be studied and discussed, but the proper answer must be had before worth while inspection can become a reality and have the respect of the public and the electrical industry.

Should our Chapters, Section and International undertake to bring about these reforms, or must it be left to the small towns and rural districts to work out their own salvation, which means a continuation of the present policies and practices?

Basic Tests for Electric Ranges

(*Continued from page 23*)

previously in regards to the way that electricity is directed through the two coils of the unit. For instance, if you know that 115 volts should go through coil "one", as would be the case on second speed on a three heat unit you would get a 115 volt test between points A and B. You would not get a test between any of the other terminals. This, of course, only holds true if the wires leading to the unit are disconnected.

Federal Rolarc SAFETY FACTORS

INCREASE PRODUCTION

When a switch fails machines stop—vital war production slows down. And one of the reasons for switch failure is uncontrolled arcing. That's why the Federal 575 Volt Rolarc Safety Switch* is built with special safety features to control and reduce arcing to an *absolute minimum*—and so to increase production by eliminating delays and accidents caused by switch failure.

Two parallel cylindrical rollers fabricated from high arc-resistant material form an insulating barrier to "dam up" and snuff the arc. This gives the Rolarc many added advantages that increase switch safety and service through perfect control of arcing.

Follow the leaders—for extra service and safety switch to Federal.

*100-600 Amperes only.

For Complete Rolarc Data

write for Bulletin 42-12. Contains all the essential facts on the Federal 575 Volt Rolarc Safety Switch.

SOUTHEASTERN REPRESENTATIVE
Fulwiler and Chapman
314 Luckie St., N. W. — Atlanta, Ga. — Jackson 2146

FEDERAL ELECTRIC PRODUCTS COMPANY
60 PARIS STREET NEWARK, N. J.

PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

LONG EXTENSION CORDS are DANGEROUS

save time.. save motion.. promote safety.. with PLUGMOLD

FOR BENCH, WORK TABLE, INSPECTION and TEST RACK, ASSEMBLY and PRODUCTION LINE WIRING. FOR HAND TOOLS, INSTRUMENTS, APPLIANCES, ETC.

Conforms to Federal Specification W-R-32. Listed by U. L. Immediately available on suitable priorities. The Wiremold Company, Hartford 10, Conn.

WIREMOLD

CAN HELP YOU PRODUCE FOR WAR . . . AND PLAN FOR PEACE!

We have shown how to make all important tests on the surface unit circuit of the range; we will now test the oven circuit. The unit can be tested with a split lamp in the same way as the surface unit. The switch also is tested the same as a surface unit switch. The results of the test of an oven switch, of course, would be different from that of a surface switch because we want different results with the unit or units in the oven. An oven will have one or two units; each unit will have one or two coils. Some ranges have a switch for each unit, others have one switch for both units. There are so many combinations in directing the electricity to the oven units that we will not attempt to describe them. However, from the markings on the switch positions, and from the number of units and the number of coils in the units, it is easy to determine what reactions you should get out of the switch.

We will describe the checking of all other parts in the oven circuit, although some of these parts are not on all ranges. A temperature control will have two or four wire connections. Two wires will be wired in series, and four wires will be in parallel and should be tested as explained previously. A two-wire connection will probably be a 115 volt circuit; a four-wire connection will probably be a 230-volt circuit.

A timer will have three or five wires connected to it. With three wires, the timer will be hooked in series in the oven circuit. The extra wire will be used to complete another circuit to operate the rotor of the timer and has no connection with the oven circuit. With five wires, the timer will be hooked in parallel in the oven circuit on 230 volts. The extra wire will be the neutral used in a separate circuit to operate the rotor of the timer. A series or a parallel check should be given accordingly to the hook up of the timer in the oven circuit.

A contactor will have four wires connected to it, the two wires that make connections going through the coil will be in a separate circuit in series with the temperature control and will not be in the regular oven circuit. The two wires connected to the contactor that complete the circuit through the movable arm of the contactor is in the oven circuit. A contactor is always wired in series in the oven circuit. In the circuit with the thermostat, the contactor is the resistance and is tested as a part in parallel.

Fair Treatment For Employees

(Continued from page 20)

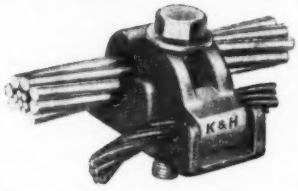
best possible, for, first, you have employed men who have not only taken up radio as a profession, but work on it as a hobby; and, secondly, by paying them well, you get better work and better business.

"Our firm is not a large one. In addition to the three regular service men, we have the two men who work part time. I have a young lady who serves as secretary, and who also serves as salesman when I am out of the building. That completes the staff. Last year, however, in addition to our volume of service work, we did a volume of over $70,000 in radio receiving sets.

"In carrying out these policies I have set up several practices which have proven successful in operation. We never check a man's radio while he waits. If he states that he is in a hurry, we explain that we will

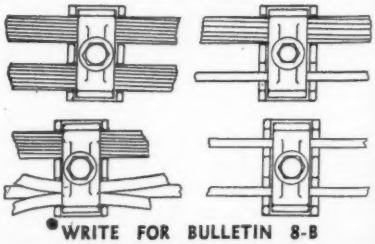
A Live Wire is no better than its Connections

Universal Tap Connector



Effectively used as guy line ground, or transformer and lightning arrester connection to A. C. S. R. or copperweld conductors where the diameters may be from 8-A copperweld to .595" A. C. S. R. armour rods. Wire sizes .595" to 5/32".

ADAPTABLE TO A WIDE RANGE OF USES



WRITE FOR BULLETIN 8-B

K&H KRUEGER & HUDEPOHL Solderless Terminal Lugs and Connectors VINE AT THIRD-ES · CINCINNATI, OHIO

be glad to turn out the job as quickly as possible, but that a radio cannot be checked and checked right in a hurry.

"In like manner, if a customer brings in tubes to be checked, we ask that they be left and picked up later. This enables us to do the work during a few spare moments, and it insures a thorough job.

"We were one of the first, if not the first, firm in this city to service car radios, and we now have a special drive-in place at the back of our store when customers wish to drive in for service.

"We do not have meetings of our employes. If something comes up, like a change in prices, a change in policy, or some other matter which requires discussion, I go back into the shop and tell them about it. In addition to this, I make it a point to know the men who work for me. If they have sickness in the family or are in some other trouble, I offer my services. And if a son or daughter graduates, or there is some other occasion for thanks, I make it a point to congratulate them. Every one is free to come to me and talk things over at any time, and they know that whatever I can do for them will be done.

"I believe that it is this policy of operating more as a family than as a business that has accounted for our ability to keep a complete staff and in being assured of their cooperation at all times. Further than this, these men were selected because they like radio. They are working not because they have to do so to make a living, but because they like their work. And because they like their work, and because they are well paid, they are contented and there is no trouble."

Seventeen years ago, Charles G. Deason, with $250 borrowed on his car, started out in the radio service business. Today, the Deason Radio Company is one of the largest of its kind in the city, in addition to doing a good business in radio sales. And, when one looks for an explanation for this growth, it is found in the sound policies on which the business was founded. Fair treatment to those men under his supervision; careful, courteous consideration to those people who have brought him their business; and an alert outlook for any plan which would improve the service or would benefit the workers have brought their rewards. It is through such policies that sound

LIGHTING EQUIPMENT

For Industrial Needs

In spite of the heavy demands of war production, Silv-A-King—specialist in industrial lighting for close to a quarter-century—is regularly filling priority orders for both fluorescent and incandescent lighting equipment. Silv-A-King lighting units offer many advantages in over-all efficiency, easy installation and maintenance—and all equipment conforms to RLM and other recognized standards for high quality and efficiency.

Silv-A-King lighting service—which costs nothing extra—includes expert guidance in planning lighting layouts for maximum efficiency, flexibility, and economy. Why not discuss your lighting problems with a Silv-A-King engineer? *And send for the complete Silv-A-King catalog today!*

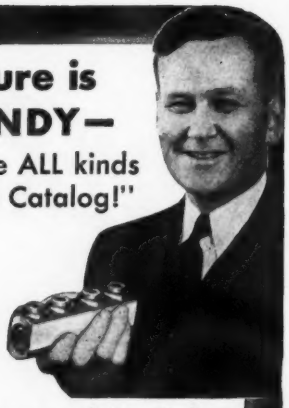
BRIGHT LIGHT REFLECTOR COMPANY, INC.
310 Morgan Avenue, Brooklyn 2, N. Y.

Other SILV-A-KING *Products*

HIGH BAY MOUNTING UNITS
"HIM" MERCURY UNITS
ISLAND LIGHTS
PAR-38 WIRING TROUGHS
"RF" FLUORESCENT UNITS
SILVERED BOWL DIFFUSERS
STOCK-AISLE REFLECTORS
VAPOR-PROOF LIGHTING UNITS
FLOOD AND SPOTLIGHTS

FLUORESCENT
SILV-A-KING
INCANDESCENT

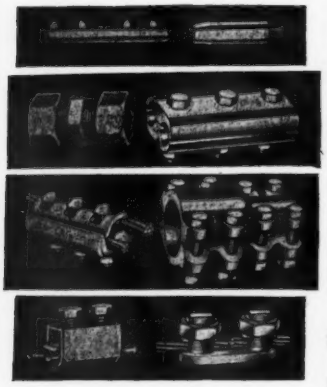
SILV-A-KING MAKES *Light* WORK FOR YOU



"It sure is HANDY— to have ALL kinds in One Catalog!"

For any good Straight or Parallel *Connector, see the* **COMPLETE** *line*

These illustrations can only suggest the wide variety in the Penn-Union Catalog . . . a *complete* line of Bolted Straight Connectors and Reducers . . . Screw type . . . Split Sleeve type . . . Shrink fit . . . Universal Parallel Clamps . . . E-Z Connectors that take a wide range of conductor sizes.



Also . . . the most complete line of Service Connectors, Tee Connectors, Cable Taps . . . Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Terminal Lugs.

Penn-Union connectors are the first choice of leading utilities, industrials, electrical manufacturers and contractors because they have found that *"Penn-Union" on a fitting is their best guarantee of Dependability.*

L. MORRIS LANDERS
309 Walton Building
ATLANTA, GA.

WALTER J. HUEMMER
Dallas Transfer & Terminal Warehouse Bldg.
DALLAS, TEXAS

PENN-UNION ELECTRIC CORPORATION
ERIE, PA.

PENN-UNION
Conductor Fittings

business is built, and it is through such that the Deason Radio Company today enjoys the sound position it holds.

Duke Power Customer Education Activities

(Continued from page 17)

telling how long. Remove ice trays carefully, defrost regularly, maintain an even temperature, clean regularly with baking soda and water, avoid overloading, lift dust from condenser unit with vacuum cleaner nozzle from time to time—these are the instructions which are being heeded by many housewives who read the newspapers.

Another advertisement was devoted entirely to that household necessity, the electric iron. It reminds the iron owner that there aren't many electric irons left and there won't be any new ones until after the war, all of which means that the smart housewife will take good care of the iron she now has because a little attention now will save time and trouble later. The housewife is told that she can keep her iron running by keeping the bottom clean, by avoiding ironing over buttons, hooks, zippers, or other hard articles, by avoiding dropping it, by being sure it is cold before putting it away, by replacing the connecting cord at the first sign of wear, by keeping the cord away from the hot iron, and by remembering that it's the contact of the heat with the dampened garment that removes wrinkles, not the pressure or weight. Don't wear yourself out pressing down, the advertisement tells the housewife. Use a light weight iron and let the heat do the job.

"Is your vacuum on vacation?" This is the question asked by a third of the series of advertisements. After pointing out that it, like other appliances must last for a long time, the advertisement tells the housewife she may keep it running by emptying the dust bag every time the cleaner is used, keeping the brushes free from hair and threads, replacing the brushes if the tufts become worn, avoiding running the cleaner over pins, nails, coins, or other metal objects—picking them up by hand instead, cleaning brushes and wiping off other attachments after using, and following the manufacturer's instructions for cleaning and oiling.

Overloading is the subject of another of the advertisements. Last year, it says, the trouble department made hundreds of special calls because fuses were overloaded. "We ask you to be careful, now, not to use too many appliances on one circuit. Use them one, or even two, at a time—but please don't use them all at once."

"That will save tires. As more tires are saved, the nation's rubber pile will last longer . . . and our boys will have better equipment to use to win the war," the advertisement closes.

In discussing what the company is trying to do, Mr. Palmer says he believes the combination of education through the home economics staff, advertising, and work in the branches plus the added efforts of the service department will be able to keep the Duke Power company's customers enjoying the use of their electrical appliances until new ones have been manufactured to take their places. If a company can do that in a war period, it has done a good job, he said.

YOU CAN DEPEND ON

Sepco

1915 - 1943

ELECTRIC WATER HEATERS

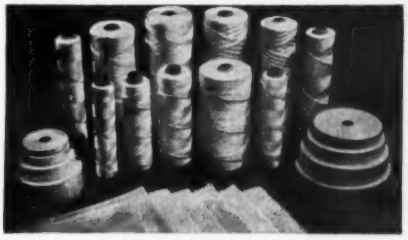
ALTHOUGH WAR TIME CONSTRUCTED THEY STILL GIVE THEIR USUAL EFFICIENT, ECONOMICAL PERFORMANCE WITH THEIR LONG LIFE LOW WATTS DENSITY HEATING UNIT, THEIR POSITIVE SNAP ACTION THERMOSTAT AND MOST EFFICIENT HEAT INSULATION MANUFACTURED AND GUARANTEED BY

AUTOMATIC ELECTRIC HEATER CO.

POTTSTOWN, PENNA.

FIBERGLAS

ELECTRICAL INSULATION



Available in Every Required Form

• Everywhere Fiberglas Electrical Insulation is demonstrating its greater dependability and longer life under the most severe operating conditions. For rewinding existing equipment, Fiberglas provides added protection against overloading and high operating temperatures.

For more permanent insulation, specify Fiberglas—yarn, tape, sleeving, tying cord, cloth, varnished tape and cloth, laminated sheet, Fiberglas-mica combinations.

Distributed By

INSULATION & WIRES, Inc.

2127 Pine St., St. Louis, Mo.
289 Simpson St., N. W., Atlanta, Ga.

INSULATION AND WIRES SERVICE

OFFICIAL WAR MESSAGE NO. 10

SHORT CIRCUIT

Businessman, wage earner, farmer. When one charges a little more . . . the others have to.

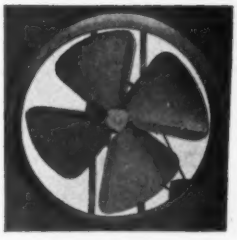
Makes no difference where the circuit starts. Farmer or wage earner or businessman. The circuit is always completed . . . and *everyone* has to pay higher prices.

As one of these 3, you may think that when *you* charge a little more, you're just "making things even." But today, even a *small* rise in prices or wages is passed on *quickly* . . . right back to you! War has made it a *short* circuit.

This kind of short circuit can give you a nasty shock and make everything go black . . . including your future security.

To avoid it, help keep prices down by keeping *your* prices down!

THE "*Fresh-Air* MAKER"



provides fully the comfort and ventilation so essential in army barracks, mess halls, hospitals, headquarters, theaters and other military buildings. Its fine design and sound construction meet the specifications drawn for army fans and it is particularly adaptable to the various types of installations found in army buildings.

HY-DUTY BLOWERS

Single Inlet—Double Inlet. 400 CFM to 12,500 CFM.

Single Inlet Blower illustrated at left is particularly adapted for ventilation of mess halls in military establishments.

BLOWER DIVISION
SCHWITZER-CUMMINS COMPANY
1145 EAST 22ND STREET INDIANAPOLIS, U. S. A.

FULLY APPROVED!

IDEAL

Wire Nuts

Solderless, Tapeless Wire Connectors

Are approved by various Government Departments to replace Solder and Tape. "Wire Nuts" SAVE CRITICAL MATERIALS—require no Tin or Rubber.

IMMEDIATELY AVAILABLE

Easy to use; strip wires, screw on—that's all! Make a neater, safer joint. Fully Approved. Listed by the Underwriters' Laboratories, Inc. Sizes for every job.

PROMPT DELIVERY

IDEAL Sold Through Jobbers

IDEAL Sycamore

• IDEAL COMMUTATOR DRESSER CO •

1017 Park Avenue Sycamore, Illinois

Sales Offices in all Principal Cities

HELWIG SPEER

Carbon Products

Multiflex Brushes

Give

Better Commutation
Longer Life
Less Commutator Wear
That Extra Demand Required
Better All Around Performance

HELWIG COMPANY

Southern Offices:

724 North Hudson, Oklahoma City, Oklahoma
Telephone: 3-3409

2005 McKinney Avenue, Houston 3, Texas
Telephone: Preston 1610

Production Records Achieved in 1943

(Continued from page 10)

imately 221 billion kilowatthours, an increase of 32 billion, or 17 per cent, over the production in 1942. This increase compares with a gain of 20,700,000,000 kilowatthours, or 12 per cent, in 1942 over 1941 and with 23,185,000,000 or 16 per cent, in 1941 over 1940.

In the four years from September 1939, when the Germans invaded Poland, to the present time, the total output of electricity has grown from 126 billion kilowatthours per year to 221 billion, or by 75 per cent, while generating capacity has grown by only 25 per cent. This has been due to the higher "load factors," resulting from longer hours and additional shifts in industry, and from the increase in the size and number of chemical and metallurgical plants where furnaces are operated continuously. These factors have largely been responsible for the ability of the electric power plants to carry the greatly increased war load and reasonably maintain their margins of reserves of generating capacity.

In addition to the production of electricity by public utility plants, approximately 50 billion kilowatthours were generated by industrial plants for their own use, bringing the total of all electricity generated for all purposes in the United States in 1943 to 271 billions. Canada and the United States in 1943 with a combined production of 312 billion kilowatthours produced about one-half of the entire world production of electricity.

Sales of Electricity Increase

The most striking feature of the entire war expansion has been the development of the metallurgical load; that is, the manufacture of aluminum, magnesium, electric steel and ferro-alloys. This type of load now constitutes the largest single classification of electric use and it seems probable that, in 1943, these processes consumed approximately 35 billion kilowatthours out of the grand total of 271 billions generated by all agencies.

Except for rural service, where the use of power was reduced by diminished requirements for irrigation pumping, all classes of service showed large rates of growth during the year. In spite of the addition of only 200,000 new customers and the impossibility of procuring new electric appliances, the use of electricity in the home increased by nearly two billion kilowatthours, or 7 per cent, to an estimated total of 28,775,000,000. The annual use of current by the average residential consumer approximated 1070 kilowatthours at the end of the 1943, as compared with 1022 the year before—an increase of 48, or nearly 5 per cent. At the same time, in sharp contrast to the rising cost of living and of doing business, the average unit price of electricity in the home continued to decline and is now about 3.64 cents per kilowatthour—an all-time low.

Compared with September, 1939, when hostilities in Europe began, the increased cost of the individual items of the cost of living, as computed from figures published by the U. S. Department of Labor, is shown by the accompanying table.

If you desire

CHICAGO OFFICE

and sales representation in all or any part of *Ill. - Mich. - Minn. - Wis. Ind. - W. Ohio,* would appreciate opportunity of negotiating with you for present or post-war business.

Pierre L. Miles Co.

20 N. Wacker Dr. Chicago 6, Ill.

All Varieties of

Subox

ANTI-CORROSIVE PAINTS

ARE AVAILABLE

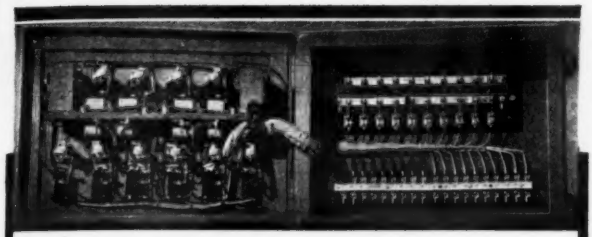
For Immediate and

SPRING 1944

Delivery

Subox, Inc.

NORTH ARLINGTON, N. J.



Marine Electrical Specialties

All types of electrical specialties, boxes, cabinets, control panels, duct-work, etc., manufactured by an organization accustomed to meeting exacting Army and Navy specifications. Full engineering personnel and equipment for manufacture of special electrical items in addition to all standard articles.

Write for information.

Jacksonville Metal Manufacturing Company
JACKSONVILLE, FLORIDA

Available BLACK SPIRIT VARNISH

DOLPH'S Spirit Varnish is a black, air drying and finishing varnish formulated for preventive maintenance work. The tough, black, glossy film presents a surface to which dirt and dust will not readily adhere. It provides a finish which is oil-proof and affords maximum resistance to acids and alkalies.

Methods of Application

Applications of DOLPH'S Spirit Varnish may be accomplished quickly and easily by brushing or spraying. In the event spraying is desired, it should be reduced four parts of varnish to one part of denatured alcohol.

Send Your Order Today

Dolph's
JOHN C. DOLPH COMPANY
Insulating Varnish Specialists
166 Emmet Street, Newark, New Jersey

TEST INSULATION THE MODERN, EASY WAY WITH A MODEL B-5 MEGOHMER

No more tiresome cranking of a hand-driven generator . . .
OUR NEW BATTERY-VIBRATOR TYPE INSULATION TESTERS OPERATE AT A
STEADY TEST POTENTIAL OF 500 VOLTS DC
available at the touch of a switch. Portable, entirely self-contained, direct reading in megohms for insulation resistance and ohms for low resistance testing. Various new models and ranges. Write for bulletin No. 430.

HERMAN H. STICHT COMPANY, INC.
27 PARK PLACE NEW YORK, N. Y.

C. B. ROGERS

ELECTRICAL HEATING ENGINEER
CHROMALOX
ELECTRICAL HEATING UNITS
and
CHROMALOX
EQUIPPED PRODUCTS

1000 PEACHTREE STREET
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